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MR. J. C. F. RANDOLPH, mining engineer, has started on a professional trip to China.

MR. J. G. MURPHY, mining engineer, has just left on a tour of inspection to mines in Colorado and Montana, his temporary address being Helena, Montana.

ACCORDING to official statistics recently published, Spain exported in the first quarter of 1884 the following quantities of ores and metals, as compared with the corresponding period of 1883: Calamine, increased from 4802 tons in 1883 to 5456 tons in 1884; pyrites, from 148,059 tons to 158,796 tons in 1884; and iron ore, from 1,061,945 tons to 1,115,367 tons. In metals, quicksilver has jumped from 185,000 kilograms to 768,000 kilograms, while lead has increased from 29,534 to 31,402 tons. Copper shows a marked falling off, from 5954 to 3597 metric tons.

WE fear that our friends of the Butte press are considerably overdoing their laudable work of booming the copper interests of that great camp. They fling about thousands of tons of monthly shipments of ore in a reckless way, and it is no uncommon matter to hear them speak of 5000 tons as a trifle. The returns of our own Bureau of Statistics and of the English Board of Trade fail to bear them out. The former reports the exports of ore in tons, including evidently all matte, but without giving the copper contents. Its figures for the past four months are as follows:

EXPORTS OF COPPER ORE.

	Quantities.		Values.	
	1884.	1883.	1884.	1883.
January	1265	468	$234,626	$96,545
February	1078	368	125,549	107,500
March	829	319	96,251	84,929
April	2837	1309	451,379	228,720
Total	6009	2464	$907,805	$517,694

Of course, a considerable part of the matte product of Butte is not exported; but there are, so far as we can estimate, nearly 2000 tons of matte in the above 6000 tons. Let it be conceded, also, that the first three months of the year will be considerably below the average, as being a poor season for shipments. The receipts in England and France of American copper of all kinds during February, March, April, and May were about 5000 net tons fine in England, and about 500 net tons fine in France. During the first four months, the exports of ingot and sheet copper from this country were about 1000 net tons, so that roughly it may be said that the ore and matte shipped contained between 4000 and 4500 tons of copper, of which the greater bulk must be credited to Montana. This is undoubtedly an excellent showing, and we expect the summer months to exhibit a marked increase. We should not be surprised to see the total copper product for the district reach 20,000 net tons fine for the year 1884, with the certainty of a further increase in 1885, after the Anaconda works are in full operation. This is cause enough for much enthusiasm; but too much is likely to be injurious. The trade has been thoroughly frightened in England, which is Butte's principal market, and it is by far more judicious to keep strictly within the facts and aid in a re-establishment of confidence than to add to the scare by exaggeration.

WE are indebted to the Boston Sunday *Courier* for an advance copy of a table showing the product of a number of the Lake Superior copper mines for the months of April, May, and June. The following table gives their output of "mineral," ranging from 70 to 80 per cent of metallic copper, for the first six months of the year:

PRODUCTION OF MINERAL FOR SIX MONTHS OF LAKE SUPERIOR MINES.

Mine.	1884.	1883.
Calumet & Hecla	12,301	10,125
Quincy	1,408	1,357
Franklin	1,052	962
Osceola	1,252	1,227
Atlantic	1,076	956
Allouez	603	576
Copper Falls	197	256
Grand Portage	138	212
Hancock	232	...
Huron	467	92
Peninsula	466	220
Pewabic	57	412
Wolverine	285	46
Total	19,334	16,441

This shows a net increase in the production of mineral of 2893 tons, a rate which would carry the product of the Lake, which was last year in round numbers 60,000,000 pounds, up to 70,000,000 pounds in 1884. It may be urged that the decline in the output of the smaller mines will cause the total to fall below that estimate. We are convinced that such will not be the case. The heavy product of the Calumet & Hecla did not begin until February, and did not reach the present average of 2100 tons of mineral until March. Last year, it produced 33,000,000 pounds of ingot. This year, it will certainly not fall below 38,000,000 pounds, and in all likelihood will reach 40,000,000 pounds, because it has already gained 3,000,000 during the first six months.

What this means may be readily understood when it is stated that the consumption of copper in the United States at the present time is certainly not more than 80,000,000 pounds, and is probably nearer 78,000,000 pounds. The Lake alone is therefore nearly capable of supplying the home demand. Arizona will certainly produce this year 20,000,000 pounds, and thus far little of it has been exported. Of the Montana make, at least 4,000,000 pounds are forced into this market and Colorado. Missouri and scattering product will furnish 2,000,000 pounds more. In the aggregate, therefore, the amount of copper that turns to our market first is fully 96,000,000 pounds, and may reach 100,000,000 pounds. Of this, 10,000,000 pounds of Lake are already contracted for abroad; but there still remains a balance which may be estimated at from 6,000,000 to 10,000,000 pounds, which we can not absorb. We do not propose, for the present, to discuss the question, where it is most likely to go, and whether the Lake companies or the Arizona producers are to export it. We merely wish to prove that for the present no sustained improvement in values is to be looked for, either here or abroad. We have in the past pointed out that there is no immediate prospect of a reduction in the make of copper in the world. Therefore

those mines that can not live at present prices should promptly shut down. There is no prospect for the next six months, either in the general outlook or in the special conditions affecting the metal. It is a clear waste of money to go into mining concerns that can only make the metal at a price equivalent to 15 or 16 cents for Lake laid down in New York. The sooner this is understood the better for all concerned.

NEW PUBLICATIONS.

TRAITÉ PRATIQUE D'ANALYSES CHIMIQUES ET D'ESSAIS INDUSTRIELS. (PRACTICAL TREATISE ON INDUSTRIAL CHEMICAL ANALYSES AND ASSAYS.) By RAOUL JAGNOUX, Chemist. 12mo, 503 pages. Paris: Octave Doin, 8 Place de l'Odéon. 1884. Price, 6 francs.

M. Jagnoux's work differs in this respect from publications of a similar character, that it assumes familiarity on the part of its readers with chemical manipulations. Its principal aim is to bring forward in a concise form the many special methods which M. Jagnoux and his father, M. E. Hautefeuille, have worked out to meet the demand for rapid and exact commercial assays and analyses. His plan is to describe briefly the different forms in which raw material and chemical and metallurgical products are met with in commerce, and then to present what he has found to be the best methods of testing them. It is a work on assaying in a wider sense of the word than that generally accepted as being limited to metals, their alloys, their ores, and their intermediate metallurgical products. M. Jagnoux takes up in succession potash and soda, barite, strontianite, lime, magnesia, chrome, molybdenum, tungsten, manganese, iron, steel, nickel, cobalt, copper, zinc, antimony, tin, quicksilver, bismuth, lead, silver, gold, and platinum. Among the special methods of M. Jagnoux is that of precipitating copper from its solutions by means of lead, and that of precipitating copper, zinc, cobalt, and nickel as oxalates.

HANDBUCH DER EISENHÜTTENKUNDE. (TEXT-BOOK ON THE METALLURGY OF IRON.) By A. LEDEBUR, Professor at the School of Mines of Freiberg, Saxony. In three parts. Octavo, 1012 pages. (*Index.*) Leipzig: Arthur Felix.

Professor Ledebur has, during the past decade, been one of the most active of those who have sought by original research to clear up obscure points in the metallurgy of iron and steel. He has known how to command the assistance and co-operation of men engaged in practical everyday work, so that many of his investigations have been timely and valuable. Evidences of constant and intimate intercourse with those in charge of large interests appear in many parts of his volumes just published, and give them a freshness and vigor that similar productions are often deficient in. This, in itself, is a strong recommendation.

Professor Ledebur divides his work into three parts, approximately equal in volume: the first, entitled an introduction to the metallurgy of iron, treating of combustion, reduction, and heat, of fuel and of furnaces and refractory materials. The second takes up pig-iron and its manufacture; while the third treats of wrought-iron and steel and rolling-mill practice. It is not quite as voluminous as Wedding's well-known work, based on Percy's Metallurgy—a fact which many will appreciate as an advantage rather than consider a drawback.

After a brief historical and statistical introduction, Professor Ledebur takes up fuel, passing lightly over wood, charcoal, lignite, and anthracite, but dwelling particularly on the manufacture of coke. He describes and illustrates the Appolt, Smet, Büttgenbach, Coppée, Carvès, and Luermann ovens; but in our opinion does not fully discuss the important question of the physical properties of coke as affecting their value in the manufacture of iron. On the other hand, he does justice to producer-gas. The chapter on furnaces takes up the Siemens, Boetius, Bicheroux, Ponsard, and Pütsch systems of firing, and gives some good hints on building. Refractory materials are, on the other hand, rather scantily treated. After a few pages on cinder and slag, there is a series of well-written articles on ores, followed by a good presentation of the important subject of roasting iron ores. The first part is concluded by a summary on the chemical relations between iron and the elements that usually accompany it.

The second part describes first the characteristics of the different grades of charcoal and coke pig-iron, and then goes into an elaborate discussion of the form and the construction of blast-furnaces, fully illustrating every point. A fine plate—one of many, we may add—is appended to this part of the work, showing the construction of No. 1 furnace of the Ilsede Works, which is supposed to represent advanced German practice, and which Professor Ledebur believes will ultimately displace the furnaces possessing a wrought-iron shell. The shaft of the Ilsede furnace stands entirely free, and the masonry is simply bound by a number of hoops. The entire top gear, platform, etc., is carried by four independent braced iron posts. This is followed by a thorough discussion of blowing-engines and hot-blast stoves, tuyeres, pyrometers, etc., and by a chapter on furnace hoists. Professor Ledebur then treats a subject on which he has largely written before, and which he has thoroughly mastered—the blast-furnace process itself. Its literature has been assuming enormous proportions through the recent work of leading English metallurgists, among whom Mr. I. Lowthian Bell is prominent, and of many investigators on the continent and in this country. Professor Ledebur discusses and gives examples of the computations of the consumption of heat in the furnace that have so often come up of late—a fact which students and many iron-masters will fully appreciate. Then follows a description of the process of blowing in, of handling cinder and pig, of correcting irregularities in working, of blowing out, and of the manufacture of different grades, including spiegeleisen and ferro-manganese, the whole being concluded by a brief review of the leading conditions affecting iron-making in different countries. The volume is closed by a chapter, necessarily brief, on smelting in cupolas and reverberatories.

The third volume takes up the great subject of iron and steel. Beginning with a chapter on classification, the properties and the methods of testing iron and steel, Professor Ledebur follows it, for some reason which it is difficult to understand, with a description of shaping iron and steel by forging and rolling. In illustrating and describing steam-hammers, Professor Ledebur, curiously, does not give a single section of the steam-cylinder and valve-gear. His chapter on rolling-mills is, on the other hand, decidedly the best yet presented in any text-book, considering that the literature on the subject is meager compared with the mass of contributions on other parts of the metallurgy of iron and steel. It is a striking fact that, in spite of the great progress made in this direction, the transactions of such societies as the Iron and Steel Institute, or the American Institute of Mining Engineers, do not contain a single representative paper. Professor Ledebur passes lightly over the different direct processes, and finery processes, but gives more attention to puddling. He illustrates, in a fine plate, the Danks furnace as modified at Creusot, and then reaches the manufacture of steel, which he introduces by a very good discussion of the physical properties of cast metal, as affected by the presence of blow-holes, etc. After a description of the crucible steel process, and a summary of the chemical investigations bearing upon it, Professor Ledebur takes up the manufacture of open-hearth and Bessemer steel. He has succeeded in crowding into less than eighty pages a complete treatise dwelling on all important points, giving a fair presentation of the mechanical appliances, and discussing the chemical reactions very fully. The final chapters in the volume deal with the manufacture of malleable iron, the production of cement steel, and the construction of welding and reheating furnaces.

It will be seen from this brief summary of the contents of Professor Ledebur's metallurgy that it is well balanced, and will convey to students a very good notion of the methods employed in the manufacture of iron and steel, of the chemical processes underlying them, while men actively engaged in practice will not turn to it in vain. Professor Ledebur has followed the system of giving a list of the literature of the subject in every chapter, as an appendix to it. The volume has a large number of very handsomely engraved plates drawn to scale, in all about 300 illustrations.

WORKING TITANIC IRON SANDS.

Mr. James Davis, of the Mossend Steel-Works, England, who, we believe, is connected with the Siemens direct process, has written the following letter to a number of English technical journals:

For many years past, the deposit of iron sand, both on the shores of New Zealand and of Canada, has been the object of much solicitude on the part of the governments of these countries, who have endeavored to use this raw material, which is so rich in metallic iron, and of which there is an almost inexhaustible supply, to a commercial advantage. It was urged that the absence of suitable fuel within reasonable distance of the deposits would always be an insuperable obstacle in the way of using up the sand on the spot; yet that obstacle, serious as it seemed, would appear to be overcome, as coal and slack from Waikato may be obtained that is suitable for gas producing.

Having experimented with these sands, I have been able to obtain good and satisfactory results, both as to its qualities in iron and steel, either by working it into finished merchant bars or converting it into soft steel by the Siemens open-hearth furnace, or by making crucible steel of a high quality. I treated the sands as under: After working the sands in the Siemens rotary furnace, reduced with charcoal or soft coal, the balls were hammered into blooms; these were rolled into good merchant bars suitable for the market; to produce crucible steel, bars were cut up into small pieces, which is usually done, and melted in crucibles, the production of which was a very fine quality of steel. For producing mild steel for plates, etc., in the Siemens open-hearth furnace, the balls were taken from the rotator and hammered or squeezed into blooms, then charged with the exact proportion of pig-iron, and gave excellent results; and so far as my experience has gone with treating ores of almost every nation directly, both by puddling and with the revolving process, I have found nothing so well adapted to treat directly as these sands.

It has been proved by experience that to work ores or magnetic sands directly they must contain a high percentage of metallic iron; this we have in these sands, as the appended analysis shows; and although so much has been expended in these countries in experiments to work up these sands, yet I have not read of any proving successful. To puddle it is by far too slow a process, and too expensive; what is required is a process that will be able to make a large output with very little cost, and will be able to meet the demands of the country; and as the Siemens furnace has now passed its experimental stage, it can be built so that with one rotator 30 tons of blooms a week can be made.

ANALYSIS OF TITANIC SAND.

Peroxide of iron	67·04	Sulphuric acid	Trace
Protoxide of iron	30·17 = Iron 70·4	Phosphoric acid	0·03
Oxide of manganese	0·22	Silica	0·51
Alumina	0·16	Moisture	0·14
Lime	Trace		
Magnesia	Trace		99·91
Titanic acid	1·64		

The principle of this Siemens furnace is well known. It will therefore suffice to say that, with a little improvement in its construction, which practical experience has suggested, it could be made to work for three months or more without undergoing any repair; moreover, with this process no skilled labor is required; therefore the cost for labor would be very low. This alone is a great advantage, as it is the high price paid for labor in some of our manufactories that prevents us from being able to compete with foreign countries; in fact, with working two or more rotators jointly, blooms could be produced at a cost of 5s. per ton for labor.

We may add that Mr. Davis has either not heard of or ignores the fact that the Wilson furnace, an American invention, has been successfully tried in New Zealand.

EDWIN K. HYDMAN, who was well known to railroad men, died June 27th, at Pittsburg, Pa. He was forty years old, and had been engaged in railroading since his sixteenth year, when he was employed to forward coal trains on the Lehigh & Susquehanna, of which road he became superintendent. He was subsequently superintendent of the Pittsburg & Connellsville, and afterward general manager of the Wabash, with his headquarters in Pittsburg. He then built the Pittsburg & Western road, and was made president of the Junction Railroad, a position which he resigned about one year ago on account of failing health.

THE CALUMET & HECLA MINES AND PLANT.

The Extent of the Property.—The Calumet & Hecla workings, from their origin and present system of development, may be divided into three sections. Beginning from the north, where the property of the company adjoins that of the Centennial, we have the Calumet, with shafts Nos. 5, 4, 3, 2, and 1 in succession; then follows the Hecla mine, whose shafts, continuing in the same direction, follow one another in rapid succession to Nos. 1, 2, 3, and 4. Farther south, and separated from the Hecla ground proper by a stretch of about 3000 feet of barren ground, are the Black Hills workings, opened by shafts Nos. 10, 11, and 12. In the aggregate, there is a total length of 13,350 feet on the vein, and the company possesses a sufficient area on the hanging-wall side of the vein to mine to any practicable depths. We may state here that surface ownership, in Michigan, carries with it the right to the mineral, and the ground into which the pay chutes of the Calumet & Hecla dip has naturally acquired a value that carries it near the figures held for the choicest city lots in our great cities.

There has been much talk concerning the Tamarack enterprise, which is now sinking a vertical shaft in the hanging country of the Calumet & Hecla lode, to cut it in depth. It has been the habit of many not acquainted with mining in general, or the particular circumstances of the locality, to urge that the "Tamarack takes the bottom out of the Calumet & Hecla," etc. The fact is, that the nearest point of the Tamarack property to the line of the Calumet & Hecla vein is fully 3500 feet distant from the outcrop measured on the dip of the lode. It is likely that in some respects the Tamarack enterprise will affect its powerful neighbor, but in a manner that will hardly be relished by the former. A glance at the ground still before them will teach that there is room enough for both, and those who have wealth and pluck to contemplate the sinking of a shaft fully 2500 feet deep, on the faith of the continuity in depth of the rich deposit in the Calumet & Hecla, certainly deserve every wish for success which, even if as brilliant as they might hope, would not in any way dim the luster of their powerful rival. The Tamarack shaft, when through, will make a fine pumping station for the drainage of the entire lode.

The rich ground of the Calumet & Hecla is distributed in chutes, of which two are distinctly defined, the one, the main chute, between the Hecla shaft No. 4 and the Calumet shaft No. 3, and the other in the South End ground. The main chute does not take a direction parallel with the dip, but makes toward the north, at an angle to it of about 70 degrees, and shows a slight tendency to widen in depth. Calumet shaft No. 5, the latest addition to the openings at this end of the line, is just beginning to enter the chute, at a depth, on the vein, of about 3000 feet. Between the Hecla No. 4 and the South or Black Hills ground, is a barren stretch of about 3000 feet. Then the lode appears to widen, rarely going below 12 feet and reaching upward of 20 feet, and for fully 1000 feet to near the boundary line gives promise of a productiveness rivaling the more developed parts of the territory. This chute, too, shows a northward dip.

It is hardly possible to realize the enormous resources of this long stretch of productive ground. The principal work of extraction is now going on between the 15th and 23d levels, while there are blocked out in the Calumet & Hecla mines twelve additional levels having a back each of 93 feet on the lode that have not been touched. In the Black Hills ground, there are nine levels, 99 feet apart on the lode, from which not a single ton of ore has been stoped. The rock extracted from the openings has paid the entire cost of sinking, drifting, machinery, track, and equipments, so that the reserves in that mine, which would be famous the world over were it not for the wonders of its neighbor, are a resource of the company for the dim future that has not cost it any thing.

To sit down in cold blood to compute the ore in sight in these mines, would be as unsatisfactory a proceeding as it would be tedious. A rough estimate, based on the most conservative data, makes the total reserves equal to twenty years' work at the present rate of production of 20,000 tons of ingot per annum. For years, the development-work has not only kept pace with the work of extraction, but has gained on it. The policy that has dictated the course thus persistently followed out is one the advantages of which a trip through the mine fully explains. It makes the work of development entirely independent of that of extraction. The mine being so dry in the lower levels that water must actually be taken down into them for the use of the drillers, and the levels standing for years without a stick of timber in them, there is practically no cost for maintenance, while, on the other hand, the great advantage of non-interference with the work of extraction is secured, an advantage that more than repays the interest on an investment for development-work that is trifling when it is taken into account that the rock extracted probably more than pays for the direct outlay. A leading thought in laying out the whole plant and equipment of the mine has been to secure a steady output or uninterrupted production. This has led to a duplication of machinery throughout. With a mill crushing more than 1400 tons of rock a day, and being equipped to increase to 2200 tons, it is impracticable to provide storage capacity for rock to guard against stoppages of any one part of the vast and intricate equipment. Perhaps the only place where rock could be stored in any quantity would be in the chutes in the mine, and even that is limited by the requirements of the timber-men. When once it has moved in its way out of ground, it must travel on until it is delivered into the stamps without lingering at any point or creating a clogging of the wheels that would be enormously expensive. It goes to the top of the shaft, is dumped into cars, is carried to the rock-house, goes through the rock-breakers, is loaded into cars, and is conveyed by a locomotive to the stamp-mill. At the rock-houses, there is, of course, storage capacity for two or three days, and probably enough is provided for at the mill to cover the same period; but the leading thought, as we have already pointed out, is steadiness and magnitude of production combined. This, of course, has involved a heavy expenditure for plant and many years of preparation during a period when the production was steadily increasing and the mine was steadily returning a heavy profit to its owners. Practically, the work is now done, and the mine, at the end of 1884, will be fully equipped to bring to the surface daily 2500 tons of rock from a depth of 4500 feet on the vein. With such an equipment; with a mine, as we shall see farther on, opened out far in advance of a number of years, all paid for out of earnings; with a rock carrying copper enough to bring the cost of its treatment far below any possible decline, it will be readily conceded, by even the most skeptical, that the Calumet & Hecla Company has before it a long career of prosperity.

The Vein.—The vein which the Calumet & Hecla Mining Company is working dips on an average from 38½ to 39 degrees, showing only comparatively slight variations. Its strike, too, is remarkably uniformly north 35 degrees east, and its thickness, considering the large amount of ground opened, fluctuates but little. It has been known to pinch to 3 feet and to widen out beyond 20 feet, but usually ranges from 8 to 14 feet. Thus far, no indications of any law in the distribution of the copper in the vein has been noticed. South of No. 4 shaft, Hecla, a fault crosses the vein, and a second one has been noticed farther south. They dip toward one another, so that the barren ground may prove to be simply a wedge. Neither of them threw the vein considerably; but they do appear to affect its metalliferous contents, the ground between the two faults apparently forming the limits of the barren ground between the Hecla and the South End territory. The fault near the Hecla shaft, we may here mention, is traceable on the surface by a slight ridge. The conglomerate that forms the vein varies from a fine grain to a very coarse aggregation, but no relation between the character of the conglomerate and the richness of the vein has yet been traced. Often the copper appears to have entirely displaced some constituent of this conglomerate, and massive round boulders of solid copper, sometimes a foot in diameter and fairly uniform in size, are found. We have seen drifts where these boulders were so frequent that the drillers were forced to abandon a number of holes. But usually the constituents of the conglomerate are practically barren, and the copper appears to have mainly displaced its cementing material. Neither in the fine-grained nor in the coarse conglomerate does the copper show a defined tendency to accumulate at the hanging or foot-walls. It is sometimes found near the one, sometimes near the other, and sometimes quite uniformly distributed over the whole vein, and occasionally sheets of copper appear to work in to the hanging-wall. There are, of course, richer and poorer streaks of ground; but the "run of the mine," if we may so term it, the entire amount of rock extracted by removing the whole width of the vein, is very uniform from month to month and from year to year. It has been noticed in a general way that the rock seems to grow richer in depth, and we have seen in several points in the lowest levels some of the finest faces of ore in the mine.

The general average width of the stopes may be put down at a minimum of 8 feet, though in the Calumet ground through which we went it is apparently nearer 12 feet. In the Black Hills or South End mine, the vein is wider, averaging nearer 14 feet. The average yield of the Calumet & Hecla rock is fully 4·5 per cent of ingot copper, while that of the South End is about 3·5 per cent of ingot. In the latter territory, however, the increased width fully compensates for lower grade, the product of a running foot of the stopes yielding a larger quantity of metal.

Other Veins.—Some time since, a cross-cut was driven into the foot-wall country from a point on the ninth level, north of No. 4 Hecla shaft, its total length being 2525 feet. At 138 feet, it struck a 19-foot amygdaloid vein; at 458 feet, a 10·5-foot amygdaloid; at 529 feet, a 43·7-foot amygdaloid; at 730 feet, the Osceola amygdaloid, 48·6 feet thick; at 947 feet, a 20-foot amygdaloid bed; at 1005 feet, a 6-inch calcspar vein; at 1156 feet, a 10-foot amygdaloid; at 1490 feet, an 18-foot amygdaloid and a 63-foot conglomerate, the Kearsarge vein; at 1906 feet, a 23-foot amygdaloid bed; and at 2062 and 2140 feet, respectively, a 25 and a 30-foot amygdaloid bed. Of all these, the Osceola amygdaloid alone seemed promising when cut.

Mining.—All the workings are in the vein, the shafts being sunk in it. The mine is opened out by drifts 60 feet apart vertically, or 93 feet apart on the dip, in the Calumet and in the Hecla mines; while in the South End mine, the drifts are driven at distances of 65 feet vertically, or about 99 feet on the dip.

All the drifts in the mine are driven 7 by 7 feet, with power drills, by contract, each drilling gang of four men being paid from $11.50 to $15 per running foot, and being charged with wear of steel, candles, Hercules powder, and supplies. The advance per month of course varies considerably, averaging from 35 to 55 feet, attaining, however, as much as 93 feet in one case in a drift into the hanging country. There are in use in the mines, on an average, 75 Rand drills, the total equipment being about 100 drills. The system of repairs is an admirable one, being done in the machine-shops of the company where duplicate parts are always on hand. Before erecting the repaired drill underground, it is tested on the surface. Experience, we may add, has shown that for the rods high carbon steel is best. The drifts are throughout equipped of late with steel rails of a comparatively heavy section for a mine road, and the rock is taken to the nearest shaft on tilting-cars with open ends, by trammers, who are furnished supplies. The proximity of shafts to one another makes the average haul a comparatively short one. Sinking is similarly done under contract, two drills generally working together. The price paid ranges from $32 to $36 a foot, the advance being from 28 to 35 feet a month. The rock is in many cases hoisted to the level above by means of a bucket and a winch, driven by compressed air. These winches have a 7-inch cylinder and 7-inch stroke, and are built at the machine-shops of the company. Whenever practicable, they are placed between the shaft and the winze nearest it, and are thus made to serve both at the same time. The stoping is done by power, using the winze as the starting-point and working both ways from it to the shaft, leaving a pillar near the latter, which varies from 10 to 14 feet, and allowing a pillar under the level above of from 6 to 10 feet, according to the character of the roof and the importance of the level as a conveyer of water. Each single lift of the stopes is driven to the boundary of the section, and is followed with the most scrupulous care with timbering that for its massiveness is almost unparalleled in mining. Every foot of rock of the vein is removed, its thickness varying in the stopes of the Calumet mine—every one of which in active operation we visited—from 8 to 18 feet. In most of the stopes, the hanging-wall is weak, though to the eye of a visitor it seems to stand very firmly. Those in charge of the mine, however, appear to live up better than any underground captains whose work we have watched to the first rule in timbering, that the time when supports must be put in is before any movement of the roof can take place. The

system followed is in a general way to timber up sections of from six to eight sets length on the strike alternating with free chutes or "mills," through which the rock is thrown to the level below. The timbers, which are from 2½ to 3 feet in diameter on an average, are placed side by side, prop by prop, in many places, and are often in heavy ground, provided with from 12 to 14 feet heavy caps or "wall-plates." In some localities, alternate sets are made up of a sill, a series of short props resting upon it, followed by an intermediate sill upon which rests a second line of props abutting against a wall-plate. At some points, the props are not placed in lines immediately following one another on the dip, but alternate with heavy timbers or sills laid one above the other. Altogether, the timbering in the stopes is unparalleled for its strength, and the facts that the large vein is removed without leading to the admixture with the ore of any thing but a trifling amount of hanging-rock, that the old stopes seem to stand for many years without caving, and that accidents by reason of falls of the roof are almost unknown, are proof that the system thoroughly and successfully deals with the problem. How enormous the pressure is when once a movement, however slight, has set in, was strikingly illustrated in one level when the timbering was being strengthened. At the point in question, a few three-foot props were showing signs of weakness, and one about twelve feet long was beginning to exhibit the destruction of its fibers in the middle of its length by their assuming the form of an S for about an inch. The cost of timbering is, therefore, one of the heaviest items in the expenditure of the mine, being not less than ten per cent of the entire mining cost. It practically monopolizes the hoisting-shafts of the mine during the day, and requires a large force which works in gangs under a timberman. The rock accumulating in the mills is loaded on cars and trammed to the shafts, where it is dumped into skips of very heavy design, weighing about two tons and having a capacity of from 3600 to 3800 pounds. A good deal of the rock comes down in very heavy masses, and special gangs of men are kept busy traveling through the mine and blasting them, either by laying a cartridge on them and tamping with a little clay or by drilling holes of suitable depth and firing. Quite frequently, the drilling work in levels, shafts, and stopes is seriously impaired by striking nodules of solid copper, which entail the abandonment of the hole.

The system of contracting for stoping is peculiar. The men are paid for the fathom of 216 cubic feet, from $11 to $13; but in many cases, the full width of the vein is not counted, Thus, in a 14-foot vein, only 12 feet thickness may be counted, sometimes only 11 feet, according to the character of the rock, the manner in which it comes down, etc. A fathom of 216 cubic feet furnishes from 18 to 19 tons of rock. All the shots in the mine are fired by special gangs of blasters.

The Shafts.—Beginning at the north end, we have Calumet shaft No. 5, which has nearly reached the 30th level, where it is just about entering more kindly rock, and it promises to reach the Calumet chute at an early date. It is a wide shaft, 17 feet by 8 feet, and is equipped with two tracks for hoisting, and will in time become one of the principal shafts on the lode. At a distance of 1115 feet south of it, is No. 4 shaft, opened out to the 32d level, in dimensions of 12 by 8. It is equipped for hoisting with one of the new drums. Distant from it 445 feet is No. 3, opened down to the 32d level and now sinking to the 33d, being a hoisting-shaft through which the rock is lifted with the great speed incident to the introduction of the new Leavitt drums. It also is 12 by 8 feet. The distance from Calumet shaft No. 3 to No. 2 is 400 feet. Besides being used for hoisting, it is used principally as a pumping-shaft, there being seven force-pumps, all having a 9-foot stroke, while the diameter of the plunger increases from 7 inches, at the lowest, the 25th-level pump, to 12 inches for the pumps on the 22d, 18th, 14th, 10th, and 6th levels, and to 14 inches for the 3d-level force-pump. The mine makes most of its water between the 14th and 18th levels. It was practically dry at all the lower points visited by us in the beginning of June. The pump is run at about from 5 to 7 strokes a minute, and has been able to handle all the water, even in the spring. A neat arrangement is provided for moving the valve chamber cover, which is lifted by screws until it can be hung in trunnions and run out of the way on an overhead track. Between the shafts 3 and 2, is the man-engine shaft, which passes directly through the stopes, being secured by very heavy timbering. Practically the man-engine shaft fulfills the functions of the usual winze between two shafts, being the starting-point of the stopes for the ground between the 3d and 2d shafts. The man-engine rods are 12 by 12-inch timber, 28½ inches apart from center to center. At intervals of 300 feet, more or less, their weight is carried by a 2-foot sheave over which a link chain passes. The lift is 10 feet, and the average speed is 6 strokes a minute. At intervals, the rods are fitted with small wheels running on a track of suitable length. The man-engine works smoothly and well, and admits of the ascent and descent simultaneously of a shift. No. 1 Calumet shaft is 415 feet from No. 2, and has reached the 32d level. It is still hoisting with the small drums. The distance between the Calumet No. 1 and the Hecla No. 1 shaft is 610 feet, the shaft having gone to the depth of the 32d level. Between these two shafts, is the Hecla man-engine shaft. No. 1 is followed at a distance of 370 feet by No. 2 Hecla shaft, both being equipped for hoisting, to which service Nos. 3 and 4 are also devoted, following one another at a distance of 650 and 405 feet respectively. No. 3 shaft has been sunk to the 25th level, while No. 4 is down to the 9th. Until the recent purchase of the Frue 40 and 80 tracts, these shafts had reached the boundary of the Calumet & Hecla property; but now, of course, they are open to development. In the stretch between the No. 4 and No. 10 Hecla shafts, 3350 feet in all, there are two shallow shafts of minor importance. There are two faults, one near the former shaft, and the other not far from the latter, which seem to have cut off the ore, the ground between them being practically barren. No. 10 shaft is the first of the South End or the Black Hills territory, where practically a new mine is developing. It is connected on the 5th level by a long drift, recently put through. The South End has three shafts—No. 10, down to the 3d level; No. 11, 800 feet distant from No. 10, is sunk to the 9th level; and No. 12, 480 feet from No. 11, developed to the 8th level; each level being 65 feet vertical lift. Sinking and uprising from different levels is now going on to carry No. 10 to greater depth. Measured on the 5th level, the distance from the shaft to the south boundary is 400 feet, while the north boundary is 3700 feet from No. 5 Calumet shaft. Roughly, therefore, the company possesses 13,385 feet in the vein, and as it happens embraces all the known rich part of this conglomerate belt, since efforts to work it in the Osceola territory to the south end in the old Schoolcraft, now Centennial, territory in the north have proved failures.

The Surface Plant.—Using the shafts as the points of division in this long stretch of ground, the surface plant may be grouped as follows, beginning again at the north end. Calumet shaft No. 5 has an independent engine, and is equipped with a Guibal fan, 30 feet in diameter. We may mention here, that it is run only a few days in the year, the ventilation in all parts of the mine being excellent. Between No. 5 and No. 4 Calumet is the Calumet rock-house, into which all the rock hoisted from Nos. 2, 3, 4, and 5 shafts is conveyed by means of a trestle-work and an endless rope, the drum-house being located between No. 4 and No. 3 shafts. Between No. 3 and No. 2, is the main Calumet hoisting and compressor engine-house, of which we shall speak in detail farther on. The gear-house is between Calumet No. 2 and No. 1 shafts, from which the Calumet and the Hecla man-engines and pumps are driven Between Calumet shaft No. 1 and Hecla shaft No. 1 is the Hecla man-engine house. The main machine-shop of both mines, and the locomotive-house, are located between Hecla shafts Nos. 2 and 3, and near it is the Hecla rock-house. Between shafts Nos. 3 and 4, is the Hecla main engine-house, in which the hoisting and compressor plant are located, driven by the "Frontenac" engine. For the South End, an independent hoisting-engine is placed between No. 10 and No. 11 shafts. It will be noted, therefore, that the entire plant is duplicated, making both the Calumet and the Hecla mines fully and independently equipped each with a hoisting plant, a pumping-engine, and a man-engine.

The main Calumet engine-house has its chief motor, the "Superior," which was started after our visit, and ran for a couple of weeks very satisfactorily. It was stopped for some slight modifications in the air-pump valves, and will probably be running by the time that these lines reach our readers. It is a compound beam-engine of the Leavitt type, with 70-inch low-pressure cylinder, 40-inch high-pressure steam-cylinder, with 6-foot stroke and Leavitt superheater. Running at a speed of 56 revolutions and with a steam pressure of 135 pounds, it develops an economical horse-power of 2500, while its ultimate capacity is 4700 horse-power, when running at 60 revolutions a minute. The engine has two 45-ton fly-wheels 32 feet in diameter. Coupled to the main shaft of the engine, which is 18 maximum and 14 minimum inches in diameter and in all 130 feet long, are two pairs of Rand compressors with 36 and 32-inch cylinders and 5 and 4-foot stroke, and four hoisting-drums, two of older type, 10 feet in diameter, 12-foot face, coiling 3000 feet of rope and driven by V friction-clutch gearing, and two 20-foot Leavitt drums, engaging by means of an Osgood & Blessing hydraulic clutch. They carry 4000 feet of inch and a quarter rope, and hoist at a speed of 1080 feet a minute. The hydraulic clutch is so thoroughly under the control of the engineer that it lifts the load gently and without shock, and that the full speed is attained after the skip has been hoisted a few feet without causing the heavy jars that are so destructive to hoisting ropes. We have watched the work of the drum as evidenced by the movement of the skip underground, and are convinced that the hydraulic clutch is far superior to the ordinary contrivances in use at mines. At present, two of the old drums have been removed, and two new ones are to be put in in their place, all this work being done while the old drums are running at one side and the pair of new ones on the other side. The plant will finally consist of six Leavitt drums, each capable of carrying 4000 feet of rope. The drums are grooved, not in sections, as heretofore, but as a whole mounted on their shafts. They weigh 60 tons each. The "Superior" will also drive by wire rope transmission, over 15-foot sheaves, the machinery in the gear-house, to which we shall refer presently. In this main engine-house, there are two reserve engines, one driving the compressors, a Corliss, with 30 by 48 cylinder, running 50 revolutions a minute, and the second, at the other end, driving the drums, which is a horizontal Leavitt engine, 40 by 60-inch cylinder, running at a speed of 50 revolutions. This engine-house, we are convinced, has no rival for its size in this country, in the magnitude and beauty of its machinery and the enormous work it is called upon to perform. Considerable trouble has been experienced here, as well as at other points, in the surface plant of the mine, with a material for the foundations that proved very unsatisfactory after being in use for some time. It is a sandstone, quarried near the railroad leading to the mill, which, when tested, showed itself capable of resisting a crushing strain of 5500 pounds per square inch. After remaining in the foundation for some time, however, it begins to exhibit a shrinkage nearly equal to that of pine wood, and a number of cracks appear in the stone. This has made it necessary to take out the foundation in many cases, and to replace it with concrete and a capping of Cape Ann granite. With these changes, and with the very heavy bed-plates used throughout in all the machinery, the plant possesses a solidity more than equal to any tax upon its permanency. Steam is furnished to the engines in the Calumet engine-house by three boilers designed by Mr. Leavitt, and built by Messrs. Kendall & Roberts, of Cambridgeport, Mass. They are covered with a mixture of sawdust and plaster of Paris, which has proved to be an excellent and cheap non-conductor. Near the boiler-house is a large coal-shed.

Between Calumet shafts Nos. 2 and 1 is the gear-house, containing the machinery for driving the two man-engines and pumps. At present, it is run by a Porter-Allen engine, with 18-inch cylinder and 3-foot stroke, running at a speed of 192 revolutions. In the future, this engine will be merely a reserve, the machinery to be driven from the "Superior" by wire rope transmission. The sheave at the gear-house is 15 feet in diameter, and will make 133½ revolutions a minute. A clutch is provided on the sheave-shaft to throw it in and out of gear. From the main Porter-Allen engine shaft, provided with a clutch, the power is transmitted by a belt to a second main shaft, from which, by cog-gearing, it is transmitted to the four shafts to which the cranks of the two man-engines and pumps are attached. By heavy connecting-rods, the motion is transmitted to rockers, the two Hecla rockers being mounted on hollow shafts 32 inches in diameter and 40 feet long, made of gun-iron, in order to carry them into line with the shafts. From the rockers, wooden rods transmit the power to the bobs at the shafts, to which the pump and man-engine rods are connected. Every one of the four main shafts is provided with Robertson clutches to throw it in and out of gear. The entire plant is of an exceedingly massive and substantial character, gun-iron castings being the material used for the bobs.

The Hecla engine-house, containing the machinery for the Hecla mine principally, is, like the others, a fine brick structure, and roomier than the Calumet building. The main engine, recently completed, is the "Frontenac," a Leavitt compound engine of the latest type, embodying all the modifications of detail suggested by the experience with the others. The Frontenac has a 27½-inch high-pressure cylinder, a 48-inch low-pressure cylinder, a 6-foot stroke and a 25-foot fly-wheel weighing 61,300 pounds. It was started early in June, and, driven for the first time, accomplished the feat of running without a load at a uniform speed of 60 revolutions a minute, with a steam pressure of 110 pounds, and throttle wide open. The engine drives the four hoisting-drums of the Hecla end, each 24 feet in diameter and coiling 3000 feet of rope. These drums are of more recent pattern than those being displaced by the Leavitt drums at the Calumet end, but still do not, in elegance of design and efficiency, compare with the latter. They are driven by V friction-gearing, the shaft being bodily lifted until it engages. Until quite recently, these drums were driven by a 30 by 72-inch Corliss engine, which will now be held as a reserve. The Hecla mine has one pair of 28 by 48-inch Rand air-compressors, until recently driven by a Corliss engine, but now to be run by the "Frontenac." We understand that they will be displaced by larger compressors of the same make. The "Frontenac" will also drive the machinery in the small but very well-appointed machine and repair-shop close by, in which all the current repairs in machinery and in the rock-drills are made.

The rock as hoisted from the mine is taken automatically, by an endless hemp rope, driven by a small engine, on a trestle-track, which overcomes any difficulties due to heavy snow-falls, to the rock-house of the Calumet and to that of the Hecla. At these rock-houses, the rock is reduced by rock-breakers to a size not exceeding that of a fist. The largest pieces are broken by a Hodge & Christie hammer, and are then put through a very large rock-breaker. The run of the mine is passed through rock-breakers of ordinary size, of which there are seven at the Calumet rock-house and five at the Hecla rock-house. The South End mine is not yet equipped in this manner, the rock being dumped until wanted, and thus at the present time acting as a reserve. The Calumet rock-house machinery is driven by a small horizontal engine, the rock being delivered into chutes from which it drops into the railroad cars. At the Hecla rock-house, the bins are of greater capacity, and are capable of storing fully two days' supply. The rock-house machinery will, in the future, be driven by the Superior and the Frontenac respectively. Now, nearly all the run of the mine, a good deal of the fine, and all the coarse, is put through the crushers, which could be more steadily supplied with material requiring actual work, if the rock as it comes from the mine were dumped on a grizzly screen. It is likely that at no distant date this part of the plant will undergo the remodeling that it needs.

The entire surface plant is supplied with water by the water-works, situate at a pond in the hanging country of the lode at some distance from it. The water-works are equipped with a splendid small Leavitt compound pumping-engine, having an 11¾-inch high-pressure, and a 24-inch low-pressure cylinder, 4-foot stroke and 17-inch plungers, with a capacity, running at 37 revolutions, of 5 million gallons. As a reserve, there is a Worthington pumping-engine, with 14 and 24-inch cylinders, 3-foot stroke, and 20-inch plungers. The water is furnished through a 16-inch main to a stand-pipe, 80 feet high, located near the Calumet engine-house. The mine-pumps deliver into the pond, and no trouble from scarcity of water has been experienced even in the driest seasons or in winter.

It will be seen, therefore, from this hasty sketch, that the surface plant is on a magnificent scale, and is so arranged that its equipment is for two mines independently, and that throughout there are engines in reserve fully capable of carrying on the work at an hour's notice. One point that might possibly strike unfavorably those mining engineers conversant with the handling of enormous quantities of material in European and American collieries is, that the rock is hoisted in skips, by single ropes, without taking advantage of the weight of an empty descending skip, to counterbalance that of the one ascending. This might be particularly objected to because the dead-weight of the skip seems disproportionately great as compared with the load carried. The leading cause for this apparent neglect of an important source of economy is, we take it, the fact that the dimensions of the old slopes are too small to admit of double track. That this is the case, is indicated by the fact that the latest shaft sunk, No. 5, is considerably larger than the others, and is equipped with a double track.

Another point that might lead to a diversity of opinion is the general plan of concentrating the machinery plant, while scattering the work of hoisting over a long line through a number of slopes, thus necessitating the use of long lines of wire rope above ground. It might be urged that it would be better to concentrate the hoisting in one or two main slopes or shafts, with cages, casting off the skips, and using rolling stock that is filled at the "mill" underground, and is dumped at the rock-house in the immediate vicinity of the main shaft. The advantages would be a reduction in the dead-weight and a saving in the cost of maintenance of ropes. Aside from the fact that this would involve a greater expense for underground tramming, and that the great number of levels from which hoisting goes on would make the constant changes troublesome, there is one great leading fact that operates against the centralization plan, and its principal advantage is the saving of the cost of maintenance of a number of shafts instead of one. That fact is, that in the Calumet & Hecla mines enormous quantities of timber must go into the mine. We have therefore two currents of transportation, if we may so term it, one of rock out of the mines and one in an opposite direction into the slopes, which are in danger of constantly conflicting with one another. First of all, it would not be good practice to haul sticks of timber three or four feet in diameter and from 10 to 20 feet long, for any distance, when it can be done cheaper on the surface than underground. Therefore a number of shafts in close proximity to one another becomes an economy instead of a waste. Then hoisting rock must be practically suspended while the timber is going in, and although the weight of the latter is not nearly equal to that of the former, its unwieldy character calls for so much time in handling that it occupies nearly all the shafts during the day, while the night is devoted to hoisting. Nor would it be possible to use a number of slopes simply for lowering timber while one shaft was steadily employed on rock, because transportation of the levels would be seriously interfered with by the improvement of timber. The system employed is therefore peculiarly adapted to local circumstances, and the employment of large engines is rendered more economical still by the fact that they have a steady, uniform minimum load in driving the air-compressors and other machinery.

The Stamp-Mill.—The mine is connected with the mill by a railroad equipped with five twenty-ton locomotives, kept in repair at the machine-shops of the company. The cars, with drop-bottom, carry an average load of 4·2 tons, and are made up into trains averaging 40 cars, a train leaving the mines every hour, approximately. The grade is a heavy one, making a maximum of about 190 feet down to the mill, and has a number of pretty sharp curves. It reaches the head of an incline at a distance of about four miles. At the incline, the cars are uncoupled in series of five, and are drawn to the incline by an auxiliary stationary engine. The rope runs over a sheave, the full cars carrying the empties up, together with any cars loaded with timber, coal, or machinery that may be shipped to the mine, and in winter, with the product of the mineral of the mill, for transhipment at the mine, via the Mineral Range Railroad to the smelting-works at Hancock. The railroad, for the greater part of the way, passes through woodlands, and is without cuts, so as to prevent any drifting of snow. It is possible to keep it clear with a snow-plow, pushed by the weight of a heavy ore-train behind it. At the foot of the incline, the cars are carried by rope drawn by a special engine to the bins of the two mills, the Calumet on the right and the Hecla mill on the left, both being on the bank of Torch Lake, accessible to water transportation in the summer.

The mills are now in process of reconstruction on a scale commensurate with the capacity of the mine. When completed, the plant contemplated will be based upon the crushing capacity of ten Leavitt stamps, with one in reserve at each of the mills, making twelve in all. These ten stamps, each of which will have an average crushing capacity of 225 tons a day, will represent an annual demand for ore of 675,000 tons, equivalent to an output per annum of fully 30,000 tons of ingot on the basis of 4·5 per cent rock. The average of the rock in 1883 was slightly above this. As at the mine, this expansion of the plant is to be carried on while the existing equipment is keeping up its present average record of 2100 tons per month of mineral. At present, there are in the Calumet mill two Leavitt and three Ball stamps, and in the Hecla mill two Leavitt and one Ball head, one of the latter class being removed to make way for an additional Leavitt stamp. At the Hecla mill, an extension is now building, and the foundations will be put in in the course of the summer for three additional Leavitt stamps, for which a part of the machinery is now on the ground; while, in the Calumet mill, the three Ball heads will be similarly displaced. With the present equipment of four Leavitt heads, having a capacity of 225 tons a day, and four Ball heads, averaging 165 tons per day, approximately, the mill treated an average of 1411 tons a day during the month of May, making 2265 tons of mineral during the month. The Ball heads have been repeatedly described, and need no special mention now. The Leavitt heads will be referred to in detail in a paper by Mr. Coggin, manager of the mill, before the American Society of Mechanical Engineers. Mr. Coggin has made their works a special study, and has devised an ingenious method of determining the velocity of the piston at any part of the stroke, which, in connection with a thorough system of indicator diagrams, has been a valuable guide in carrying the machine to its present high standard of efficiency.

The valve gear has been somewhat modified, and other changes have been made that have all contributed to reach the saving of over 30 per cent in steam consumption, as compared with the Ball stamp. One of the Leavitt stamps has reached a duty of 234 tons a day. The Leavitt stamps are run with a steam pressure of 90 pounds, cutting off at about two tenths, with a receiver pressure of 55 pounds, making 90 blows a minute. The velocity of the piston is, for the greater part of the blow, about 17 feet, the weight of the shoe being, when new, 600 pounds. It wears down to make half its weight in from 5½ to 6 days. The rock is crushed through a $\frac{3}{16}$-inch screen, made of steel plate, being the "common" steel of the Crescent Steel-Works, Pittsburg. The new plan contemplates the erection for each head of four sets of washing machinery for each stamp, each set consisting of four Coggin separators, the principle of which was described in a recent paper before the American Institute of Mining Engineers. In the Hecla mill, there will be 168 Collum jigs for dressing, and 96 for rejigging; while the Calumet mill will have 112 machines for dressing and 64 for rejigging. In each mill, there will be six 5-stamp batteries of the California pattern, with 750-pound stamps and 6-inch drop, which will be used for restamping and rewashing the waste sands. For the treatment of slimes, the ordinary round rotating buddle, with water-spray discharge, has proved more efficient than the Evans buddle generally used in Lake Superior copper dressing-works. The sands are to be elevated by the great sand-wheels, a description of which has been already published. One of these was already in place, and was being equipped to take its place in the plant.

As in all the other parts of the enormous plant, the stamp-mills are equipped with duplicate machinery, so that there will be no possibility for stoppage of work through break-downs, however unimportant. Accordingly there are two driving-engines, one the "Erie" and the other the "Wabeek," the latter having formerly served as the hoisting-engine on one of the Hecla shafts. The Erie is both a driving and a pumping engine, being of the compound Leavitt vertical type. It has an 11½-inch high-pressure cylinder, a 24-inch low-pressure cylinder, and 4½-foot stroke. With 100 pounds steam, and running at a speed of 46½ revolutions, it develops 200 horse-power. With two 16½-inch plungers, and 23-inch buckets, it has a pumping capacity of 10,000,000 gallons. It drives all the washing machinery in the stamp-mills and tail-houses by wire rope transmission, the main rope, which runs on a splendid sheave 13 feet in diameter, running at a speed of about a mile a minute. The "Wabeek" will be the main driving-engine, being just in the course of erection after some alterations. It, also, is a Leavitt compound engine, with 22¾-inch high-pressure and 38-inch low-pressure cylinders and 5-foot stroke, and when running at 45 revolutions will develop over 600 horse-power. The main pumping-engine

is the Ontario, a Leavitt compound engine with 17½-inch high-pressure cylinder, 36-inch low-pressure cylinder, and 5-foot stroke. Running at a speed of from 20 to 30 revolutions a minute, with steam at a pressure of 100 pounds, it is capable of pumping 20,000,000 gallons of water a day. As a reserve, the water-works possess a Brown 18 by 48 horizontal engine, geared to a pump having a capacity of 20,000,000 gallons a day, when running at 25 revolutions a minute, the pump having a 6-foot stroke and 36-inch plunger. This plant is furnished with steam by a nest of "Elephant" boilers, 30 inches in diameter and 44 feet long. A new boiler, built by the Dickson Manufacturing Company, of Scranton, is to be put in, having a 90-inch shell, being 34 feet long, and with a heating surface of 2800 square feet. It is rated at about 700 horse-power. For the Calumet stamp-mill, there is a plant of "Elephant" boilers, while the Hecla mill is furnished with steam by four locomotive boilers, 6 feet 8 inches in diameter and 32 feet long, with 1800 square feet of heating surface in each. The mill has a fire-engine and fire service, a machine-shop and a cooper-shop. It is accessible by boats drawing 13 feet of water, and is the main receiving station for coal and machinery, and the principal shipping-point by lake of "mineral." The work is thoroughly systematized.

The tailings run about from 0·8 to 0·9 per cent of copper, and some of the sands from 1·5 to 2 per cent. Professor Richards, of the Massachusetts Institute of Technology, last year began a series of experiments looking to the recovery of a part of the copper thus lost, but has not as yet completed them.

This brief sketch may serve to convey some idea of the magnitude of the operations of the greatest and most successful metalliferous mine in the United States, and may aid in forming some conception of the brilliant future still before it. For the richness and magnitude of its ore-body, for developed reserves, for completeness and efficiency of its mining and crushing plant, the high quality of its product, the low cost of production, and its exceptional financial position, it stands unrivaled among the mining enterprises of the world. The credit for having carried the mine to its present point is due to the concerted efforts of Prof. A. Agassiz, the President, and his staff at the mine, Mr. J. N. Wright, Agent; Mr. J. Duncan, Assistant Superintendent; captains Hoatson, Daniels, and Wills, in charge of the underground work; Messrs. L. S. Woodbury and J. Ramsey, the former mechanical engineer of the Hecla mine and in charge of the machine-shop, and the latter in charge of the Calumet machinery; Mr. F. G. Coggin, superintendent of the stamp-mills; and Captain West, formerly of the Coast Survey, who has systematized the topographical work and the underground surveying of the property of the company. Mr. E. D. Leavitt, Jr., of Cambridgeport, Massachusetts, is Consulting Engineer.

We can not close without referring to the relations of the company with its 2000 employés and men, the majority of whom live in cottages in Calumet, let by the company at a nominal rent, while a part occupy dwellings in the adjoining village of Red Jacket. The company has built a schoolhouse, in which 1400 children are taught, and has established a relief fund into which employés pay 50 cents a month, the company doubling the amount thus raised. Out of this fund, medical attendance, either at the residence or at the hospital, is provided, together with free medicines, certain sums being paid monthly to subscribers during sickness, to those disabled, and to the widows of those killed. This fund has now an accumulated reserve of about $40,000.

THE LIFE OF A TEN-CANDLE LAMP.

Herr Zacharias has made some experiments on the life of incandescent lamps, which he has published in the *Zeitschrift für Electrotechnik*. He found that a lamp of 10 candle-power (normal) would last for the undermentioned number of hours when giving the different candle-power mentioned below:

Candles.	Hours.	Candles.	Hours.
10	5500	19	534
11	3963	20	443
12	2857	21	371
13	2134	22	312
14	1628	23	266
15	1292	24	228
16	1000	25	196
17	802	30	163
18	651		

The life of an eight candle-power lamp (normal) he found to be as follows:

Candles.	Hours.	Candles.	Hours.
8	2260	15	233
9	1470	16	179
10	1000	17	145
11	714	18	118
12	512	19	96
13	385	20	80
14	290		

The duration of the lamp is therefore a relative quantity, and depends on the current that is supplied to it. Now, it is manufactories which make great use of the electric light, and in the greater portion of them to raise or lower the elastic power of the steam by one to half an atmosphere is to proportionally vary the power of the motor, and consequently the current furnished by the dynamo. Why not employ a voltmeter for the engine-driver to consult? The utility of the apparatus is shown by the following example: Herr Zacharias had occasion to install electric lamps in a paper-mill and another works under exactly similar conditions, namely, same machines and the same mounting and fittings. The only difference was in the motor and the engineer. The works were supplied with power by an old single-cylinder engine, which worked most irregularly, while the other had a three-cylinder engine; but the engineer of the former was constantly looking after the working of his apparatus. He had a voltmeter and a variable resistance at his disposal, which enabled him to take care that the electro-motive force remained uniform at 98 volts. Now, half the lamps at the works (each requiring 50 volts) lasted for 2800 hours, while in the paper-mill, the installation in which was completed several weeks later than the other, a large number of lamps had to be renewed within a short time.

THE BABCOCK & WILCOX BOILER.

Mr. G. H. Babcock, President of the Babcock & Wilcox Company, of this city and Glasgow, Scotland, has written a letter to the *Engineer*, in reply to an editorial in that journal, from which we extract the following:

I certainly would not claim that it will "never prime and never boil dry." It has the possibility of either, in common with any other boiler ever made, when treated in the same way. If filled full of water, it will prime, and, if not fed for a sufficient time while firing, it will boil dry, and so will any other boiler. Whatever may be said of "the class as a whole"—and I shall not dispute your statement that "it is generally admitted that it primes"—I may, perhaps, be permitted to say that that is not generally admitted of the Babcock & Wilcox boiler. Probably no other style or form of boiler has been so often and carefully tested on this point by so many competent engineers, and in no instance has it, when so tested, been found to have as much as 5 per cent of entrained water, an admittedly low average for other classes of boilers.

The boilers of the Montana failed, not because they were water-tube boilers—and it is questionable whether they deserve that name any more than Lancashire boilers deserve to be called tubular—but for causes which should have been apparent to an experienced engineer on inspection of the drawings, namely, inadequate provision for unequal expansion and contraction. Others have failed because of inadequate provision for circulation, causing priming and overheating of parts even with sufficient water; others because there was no provision to prevent fouling and burning in bad water; and still others because of bad proportions and bad mechanical construction. None of the above faults is essential to the type, nor are they confined to the type, boilers of other types having notably failed from the same causes.

But you have curiously overlooked an instance of remarkable success of a water-tube boiler in this country—the Galloway boiler. The only thing that distinguishes this boiler from its prototype and near relative, the Lancashire, is its water-tubes, and they constitute its sole claim and cause of superiority. By them, some of the advantages due to the pure water-tube type have been grafted upon the Lancashire—such as thorough circulation of the water, the breaking up and distribution of the currents of hot gases, and a consequent increase in economy of fuel. The pure water-tube type, when well engineered, adds also the element of safety, because of dividing the contents into a number of comparatively small and strong compartments, instead of confining them in one large shell, the giving out of which will cause a general explosion; the element of accessibility for cleaning without necessitating entering the boiler itself, whereby the engineer in charge may personally inspect the thoroughness of the operation, which can not easily be done in the ordinary types; the element of quick steaming, invaluable in many cases; and the element of ready complete repair by substitution of a new and perfect part for an imperfect one, instead of "soft patches" and hurried makeshifts. This latter element is also a considerable addition to the question of safety; for where a repair is so quickly and easily made, there is little temptation to continue the use of a boiler having dangerous defects.

You very truly say: "There have not been any factories destroyed by tubular boilers. This much we concede at once. But there have been several bad accidents with them, and not a few lives have been lost." How many lives may have been lost by means of water-tube boilers in this country I can not say; but in America, where they are in far more extensive use, the number is very small, and remarkably small when we consider the number of crudely conceived and poorly constructed water-tube boilers that have been sold on the general reputation of their supposed safety. With the same blundering in other classes of boilers, there have been hundreds of lives lost to one by tubular boilers. In the case of the boiler the history of which I know best, not a life has been lost in eighteen years. That this immunity is not due to want of use, I would say that in that time there have been installed some 300,000 horse-power, and that at least 95 per cent of all that have ever been sold are in use to-day.

You ask for facts as to their comparative cheapness. I will give you one instance out of many. The Belcher Sugar Refining Company, of St. Louis, Mo., found, on comparing estimates, that on its plant of 3000 horse-power it would save in first cost, including buildings and ground, $100,000 by adopting the water-tube over the Lancashire type. There might not be the same difference in this country, but the question of space in cities is very important. You ask for facts as to their economy of fuel. The Oliver Wire Company, of Pittsburg, Pa., found, on extensive trial, under similar treatment, a saving of 34 per cent in favor of water-tube, instead of externally fired return-flue boilers. The Raritan Woolen Company, of New Jersey, found, by its yearly coal bills, a saving of at least 20 per cent over Lancashire drop-flue boilers. A case was tried last year in the Superior Court of the State of New York, wherein it was set up as a defense to the payment for a plant of water-tube boilers, that there had been a guaranteed saving of 20 per cent over any other boiler, which saving had not been proved. After taking testimony, including such well-known and disinterested experts as Charles E. Emery, C.E., M.E., of New York; William Kent, M.E., of Pittsburg; and George H. Barrus, M.E., of Boston, and others, the judge decided that, though it was not proved that such guarantee had been given in that case, still it was proved that the water-tube boiler in question "would save 20 per cent in fuel over other boilers."

In conclusion, permit me say that the water-tube boiler can hardly be called a failure, with the record of the Galloway in this country, and the Babcock & Wilcox in America and Europe, and in face of the fact that three quarters of all the sugar refined and of sewing-machines manufactured, the largest and most successful steam-heating plant in the world, a large part of the woolen, cotton, iron, steel, paper, clock, flour, chemical, oil-refining, and other plants, all the Edison and much of the other electric lighting and manufacturing, the cable tramways of San Francisco, Chicago, and Brooklyn Bridge, and hundreds of other kinds of work in the United States, are driven by water-tube boilers, to say nothing of the many installments in Great Britain and on the continent.

THE COROCORO COPPER MINES.—According to *El Siglo Industrial*, of La Paz, Bolivia, the mines of the Compañia Corocoro de Bolivia, of Noel Berthin, of the heirs of Marquiegui and of D. E. de las Carreras & Sons together produced at the rate of 213 cajones per annum.

ELECTRO-MAGNETIC ORE-DRESSING AT THE FRIEDRICHSSEGEN MINE, OBERLAHNSTEIN, GERMANY.

A few years since, the announcement was made through the technical press that a system of electro-magnetic ore-dressing had been tried in Germany. The plant, which has now been at work for three years at the Friedrichssegen mine, near Oberlahnstein, has been recently described in greater detail by Herr Otto Heberle, at a meeting of the Verein Deutscher Ingenieure. The Friedrichssegen mine produces ore containing a good deal of iron ore and zinc-blende, which are difficult to separate, because their density is nearly the same. Two classes of ore are mined, cobbing ore, from which some pure salable ore is separated by hand-sorting, and smalls. That part of the cobbing ore that is rejected in sorting goes to the electro-magnetic separators, while the smalls are dressed in the usual manner. Middlings containing blende and iron ore are obtained also in this dressing, and they too go to the electro-magnetic plant. The material for that process obtained by sorting ranges in size from 40 to 120 millimeters, while the ore from the ordinary dressing plant is 6-millimeter stuff. It is worked by first roasting, separating by means of the electro-magnets, and then jigging.

The object of the roasting is to prepare the material for the subsequent process by converting the iron into magnetic oxide. The picked lump ore is roasted in a shaft-kiln, with coke-dust as fuel. The consumption of fuel is slight on account of the sulphur in the blende, not being greater than 110 pounds to 8 tons of ore, which are daily put through one

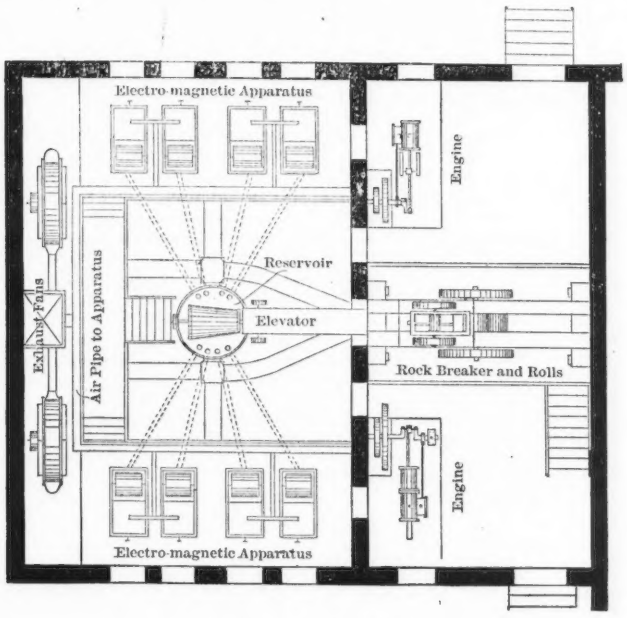

FIG. 1.—PLAN.

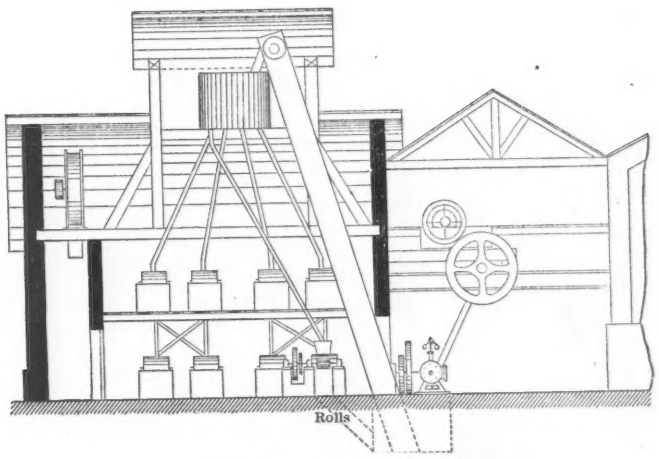

FIG. 2.—ELEVATION.

furnace. The furnace requires the labor of two men. The roasted ore goes to a rock-breaker and to a pair of rolls below it, which reduce the rock to 5-millimeter grain, and deliver it to an elevator that takes it to the electro-magnets.

The fine middlings obtained in the wet dressing are worked in one reverberatory furnace with a hearth 12 feet wide and 38 feet long, provided at each side with a fire-place, 5 working doors, and a discharge opening, and in one smaller reverberatory, the hearth of which is 6 feet wide and

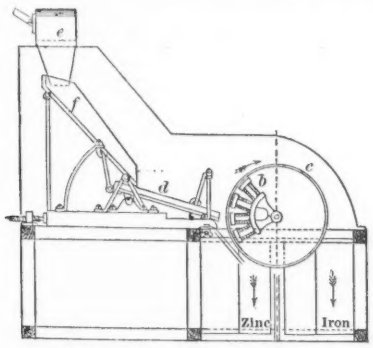

FIG. 3.—SEPARATOR.

22 feet long, and which is provided with one fire-place, two working doors, and a discharge opening. Roasting takes an hour and a half. These two furnaces have a capacity of from 18 to 20 tons in twenty-four hours; but of course the cost of fuel and labor is much greater, being fully three times as large as that of roasting the lump in kilns. After being roasted, the ore is spread out on a cooling-floor, is then passed over screens to get out sintered lumps, and is then delivered by a bucket elevator to the hopper into which the crushed and calcined lump ore goes. In this hopper, the ores are put through a screen with 4-millimeter mesh, the fines falling through chutes to the magnetic separators, while the coarse is crushed by a small set of rolls.

The dressing is done by 16 electro-magnetic apparatus arranged in sets of four in pairs above one another. The upper pair receives the ore from the chutes, and partially separates the blende from the iron. The products obtained are worked over once more in the lower apparatus. They are, 1st, a mixture of blende and quartz; 2d, iron ore; 3d, blende middlings; and 4th, iron ore middlings. The middlings are treated over again. As there is a good deal of dust in working, all the apparatus are connected with an exhaust-fan. The apparatus, which is shown in Fig. 3, is constructed as follows: The electro-magnets *b* are attached to a solid stationary shaft. In front of the brass cylinder *c*, which revolves around the magnets, is a shaking-table *d* and a distributor *f*. The ore drops from the chutes and through the funnel *e* upon the distributor and the shaking-table, which delivers it on to the brass cylinder *c*. As soon as the ore reaches the vicinity of the cylinder, the particles of magnetic oxide are retained, while the blende drops by. By the rotation of the cylinder in the direction indicated by the arrow, the particles of iron finally escape beyond the action of the electro-magnets and fall off at the other side of the cylinder. By adjusting the distance of the shaking-table from the cylinder, different sizes of ore may be treated. The electric current is generated by dynamos, one machine that requires a motive power of one horse-power being sufficient to supply four separators. With two sets of four apparatus of the plant now at the Friedrichssegen mine, 24 metric tons of ore, running from 12 to 15 per cent of zinc, and from 20 to 22 per cent of iron, can be treated for each set in twelve hours, yielding a product of 7 tons of blende and 18 tons of iron ore. The former contains about 33 per cent of zinc, and the latter from 36 to 38 per cent of iron and 10 per cent of manganese. The iron ore is sold as such. The zinc ore is worked further by screening to obtain 1, 2, and 3-millimeter sizes and jigging. The object is to get rid of the gangue in the product, and to obtain the lead in it. In this manner, the percentage of zinc in the ore is carried up to 38 per cent, while the lead ore carries about 65 per cent of lead, and 0·004 per cent of silver. The fine dust is washed in buddles, yielding lead beadings carrying 55 per cent of lead, and zinc beadings containing 32 per cent.

THE DUTY ON CRUCIBLE STEEL ROPE-RODS.—In a letter to the Collector of Customs at San Francisco, transmitting the appeal of the California Wire-Works from his decision assessing duty at the rate of 45 per cent *ad valorem* on certain crucible steel rope-rods, which the appellants claim to be dutiable at the rate of $\frac{6}{10}$ of a cent per pound, the Treasury Department answers as follows:

It appears that the steel rods are valued at over 3½ cents per pound, and that they are intended for use in the manufacture of wire for steel wire rope. Steel wire rods of this value are not specially provided for in the tariff act, and consequently they come within the provision (T. I., new, 183) which imposes duty at the rate of 45 per cent *ad valorem* on "steel not specially enumerated or provided for in this act." The collector's decision is thus affirmed.

NATURAL GAS DANGEROUS.—The report of the underwriters' committee on the use of natural gas, says the Pittsburg *Dispatch*, is a very positive and salient document. It finds "much to condemn and nothing to commend in the reckless and hasty manner of introducing gas under high pressure through our streets." The report not only shows the necessity of changing the methods, but it also points out the way in which that can be done so as to settle the disputes now in progress. The supply of gas under low pressure calls for a system of tankage from which the low-pressure distribution would be made. This system of tankage, together with pipes in the street, should be owned or controlled by the city, and the owners of gas-wells could compete for the privilege of having their gas run through the streets to consumers. Thus, the Penn Fuel Company could contract with a city consumer to supply so many thousand feet of gas daily at the works and deliver that amount at the tanks, whence it would be distributed at low pressure to the consumer. This is but the outline of a plan suggested by the report of the underwriters' committee, but it is evident enough that some such arrangement is necessary to make the gas available while avoiding the dangers pointed out in that document.

A GENERAL METHOD OF TOUGHENING GOLD (AND SILVER) IN THE MELTING-CRUCIBLE.*

By Dr. James C. Booth, of the U. S. Mint, Philadelphia.

Gold and silver differ from other elements, except those of the platinum group, in their feeble affinity for oxygen; and by means of this property, we can separate the noble metals from others by fusion in the fire, in which heat removes oxygen from gold and silver and attaches it to the others. To this first class, we may add a second, embracing iron, nickel, copper, tin, bismuth, and lead, whose oxides may be reduced to metal by being heated with fuel, or without reduction can be melted with fluxes or slag. A third class, arsenic, antimony, and sulphur, are reduced and volatilized, or are fluxed off with alkali and oxides of the second class.

To illustrate the subject practically, I shall describe an operation of toughening brittle gold that I recently performed at the United States Mint at Philadelphia. Some brittle gold, having been accidentally melted with a quantity of well refined and tough gold, was found to have rendered the whole mass very brittle, with a highly crystalline fracture, and therefore useless for coinage. I determined to avoid loss of time, and the greater cost of refining by acid, and to toughen it wholly by fluxing. This was accomplished on $75{,}162\frac{55}{100}$ ounces (=5154 pounds avoirdupois) in 1½ days, at a trifling cost and with scarcely apparent loss. The 75,000 ounces were divided into 14 melts of about 5400 ounces each, and each melt separately toughened. The ingots, easily broken into pieces by striking them on the edge of a wooden box, were put into the crucible with soda-ash and anhydrous fused borax, in the ratio of one or two ounces to a melt, until the crucible was nearly full. It then appeared as a quiet mass of metal covered with a rather viscid slag, disposed to swell and puff. A few crystals of saltpeter, say one or two ounces, were then dropped successively into the center of the metallic surface, and as they melted, their spreading out over the whole surface was aided by the concentric motion of the bottom of a small crucible. The moment the visible oxidizing action began to slacken, the melter skimmed off, by a small, black-lead dipping crucible, the fluxed matter as rapidly as was consistent with the care necessary to avoid taking up metal. The remainder in the melting-pot was toughened metal.

There are several points worth noting in the operations just described: 1. One part of the foreign matter was sufficient to impart brittleness to 75,000 parts of good standard gold (st. gold = 900 gold + 100 copper, etc). 2. By a slight oxidizing process, the matter causing brittleness was collected and removed at a trifling cost in 1½ days, without appreciable loss of gold. 3. Still more remarkable is the fact that the 14 melts of gold, in their brittle state, proved by assay to be of true standard, 900 gold + 100 alloy (usually 90 copper + 10 silver), after their brittleness had been changed to toughness by fluxing and skimming, were still 900 gold + 100 alloy, inappreciably altered. So delicately executed is the act of toughening, that, although 10 per cent of the metal is easily oxidized copper, yet the ratio of copper after fluxing is the same. 4. Another point worthy of remark is, that the toughening proceeds from the top downward, to the depth of from 9 to 12 inches of its own accord, although it is stirred toward the close of the operation to render the melt uniform throughout.

I do not wish the inference to be drawn that every case of toughening brittle gold is as successful or simple as the above. When the metal contains a larger proportion of foreign matter, the operation of fluxing, nitering, and skimming may have to be repeated, perhaps more than once. While the crucible is on the fire, the perfection of the toughening may be readily ascertained in two or three minutes by casting a thin strip, ¼ – ⅜ inch thick, and doubling it under the hammer or rolling it, the cracking of the strip in this case, if any, or its snapping asunder, informing the experienced eye of the degree of completeness in the toughening operation.

When the bullion appears to be baser, to contain a larger amount of foreign matter than in the example specially quoted in this paper—and experience can often make an approximate guess at the degree of baseness as well as at the nature of the elements causing it—then the only change made in the toughening consists in using a larger amount of soda and borax, and a still larger proportion of niter. Two points are to be noted in the use of a large amount of this more oxidizing flux: 1. That some of the graphite of the crucible at the level of the liquid is cut away, injuring the crucible and weakening the oxidizing power of the niter. 2. That since the larger bulk of fluxing matter increases the time of skimming, some of the oxidized foreign matter, in the presence of a large amount of metal, and surrounded by graphite, tends to revert to the metallic state.

To obviate these difficulties or objectionable features, after going through the stronger oxidizing process, as above described, the oxidation is suddenly fixed by the rapid addition to the floating slag of sand-lime or bone-ash, which is stirred with the slag and thickens or stiffens it, so as to allow more deliberate skimming of the whole mass without fear of reoxidization. I have tried the three thickeners above named, which seem to act rather mechanically than chemically, and, of the three, prefer sand. Where thickeners are employed on standard gold, there is greater liability to an increase in fineness of the standard by the removal of oxide of copper, together with the oxidized embrittler, so that brittle gold of 900 after toughening may be 900·5 or even 901.

The toughening of the above 75,000 ounces effected in 14 meltings (14 cruciblefuls) of over 5000 ounces each in standard gold, resulted in less than a cruciblefuls of skimmings. The skimmings are worked down to metal and poor slag as follows: They are quietly melted and cooled slowly, so as to form a *king* of metal at the bottom of the crucible, and a glassy or cindery slag above. The last is ground and separated by sifting and washing into metallic grains and poor cinder. The grain and king are again fluxed and treated as before, either by themselves, or as usual with other light residues. Thus the impurities of gold (and silver) are successively worked out, by concentrating them in a small bulk and weight of metal, and purifying it with a greater diminished risk of loss of gold than if we attempted to purify a large mass at one operation. In the case detailed in this paper, the impurities were concentrated by a single operation of purifying in a king of about eight ounces. From the purification of this king, we have ground for asserting that the impurity causing brittleness in the whole 75,000 ounces was a small fraction of an ounce, probably $\frac{1}{300000}$ or less, of the original weight.

As a concluding note to this paper, I must state that a great deal of skill is required to avoid loss of gold in executing the process herein detailed; that the melter must have unusual powers of observation and long practice to acquire the necessary skill; and I deem it but justice to state that Mr. F. C. Garrigues, my foreman, especially in the melting department of the Mint, possesses the requisite skill and practice, and that he performed the operations above described.

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GOLD CHLORINATION IN CALIFORNIA.

Under the above title, Mr. F. D. Browning, E.M., describes, in the last issue of the *School of Mines Quarterly*, the plant and the method of working at the Providence Mill, Grass Valley, California. The rock is quartz, carrying on an average seven per cent of sulphurets, chiefly pyrites. It goes without sorting to the grizzlies, the coarse stuff being delivered to the rock-breakers. From the bins, the ore is fed by Hendy automatic feeders into the batteries of the 40-stamp mill. The stamps drop 7 inches, 96 times a minute, their weight being 750 pounds. They crush through a No. 5 punched screen, equivalent to a from 30 to 40-mesh sieve. The free gold is amalgamated in the battery and on silvered copper plates, which are inclined 1¾ inches in a foot, this steep pitch being employed to keep the plates clean and yet avoid the use of too much water, which would flood the concentrators. They have the full width of the battery, and are four feet long. Beyond them, are two sluices, each sixteen inches wide and 14 feet long, having the same pitch. The pulp is carried through launders to Frue vanners, there being two to each battery, or sixteen in all. The concentrates, which contain as a maximum 10 per cent of sand, are dried and then go to the chlorination-works. They are reported to carry $120 in gold and $12 in silver per ton. The sulphurets are roasted in two-story furnaces, with a third hearth on top of the furnace, the latter acting as drier and pre-heater.

The ore is roasted in two-ton charges, remaining twelve hours in the second hearth and four hours in the bottom hearth. The temperature is allowed to go down, and one per cent of salt is added. One man works one furnace in eight-hour shifts. The roasted ore is sieved and is put into tubs holding 2½ tons of ore. For each of these, as much chlorine is used as can be produced from 8 pounds of black oxide of manganese, 22 pounds of salt and 16 quarts of 66 Baumé sulphuric acid. When chlorinated, after two to three days, the gold is washed out with water, and precipitated with sulphate of iron. The silver remaining in the residues, chiefly as a chloride, is extracted with hyposulphite of lime, and is precipitated with calcium polysulphide. It is claimed that 94 per cent of the gold and 60 per cent of silver are saved.

The mill is run by a 6-foot Pelton hurdy-gurdy, driven with 104 inches of water under a 390-foot head, costing 16 cents an inch, so that the power costs $16.64 a day. The batteries, concentrators, and chlorination-works take five inches of water.

Mr. Browning estimates the cost of milling as follows:

COST OF MILLING AT THE PROVIDENCE MILL.

Three men at rock-breakers at $2.25	$6.75
Three men at batteries at $2.25	6.75
One man at concentrators at $2.50	2.50
One foreman	3.50
110 inches water at 16c	17 60
Wear on shoes (steel at 11c. per pound)	6.11
" " dies	3.42
" " screens	3.87
" " rock-breakers, concentrators, and copper plates	5.00
Illuminating	1.00
Lubricating	1.00
Total	$57.50

The average quantity of ore milled per month is 1850 tons, or 62 tons a day, which brings the cost of milling and concentrating to about 93 cents a day.

Mr. Browning puts the immediate daily expense of the chlorination-works, which have a maximum capacity per day with two furnaces of 9 tons, as follows, when running at full capacity:

1 foreman	$3.00
1 white laborer	2.25
5 Chinamen, at $1.50	7.50
2 cords wood, at $5	10.00
29 pounds binoxide manganese, at 2¾c	.80
260 pounds salt, at 1c	2.60
216 pounds sulphuric acid, at 2c	4.32
Lime, sulphur, and calcium hyposulphite	.30
Illuminating	.20
Extras	1.00
	$31.97

The mill, however, produces only 4½ tons a day; but as the works are kept running, the actual cost is higher, the estimate based upon 4½ tons per day being:

Labor	$12.75
2 cords wood	10.00
14 pounds binoxide of manganese	.38
126 pounds salt	1.26
104 pounds sulphuric acid	2.08
Lime, sulphur, and calcium hyposulphite	.15
Illuminating and extras	.70
Total	$27.32
Cost of milling	57.50
Total outlay per day	$84.82

or $1.37 per ton, not including general expenses, interest on and depreciation of plant.

A PETITION was filed June 24th in the United States Circuit Court at Baltimore for the District of Maryland, by the trustees under a mortgage, against the Chesapeake & Ohio Canal Company, for the appointment of a receiver and a decree for the sale of the canal. An order was passed appointing August 1st for a hearing of the petition.

SILICATE-OXIDE PAINT.

According to *Engineering*, an addition has lately been made to the number of paints of the class known as silicate and oxide paints. Some years ago, there was discovered in the valley of the Dart a thick deposit of silica in natural combination with oxide of iron—a deposit believed to be unique of its kind. Analysis showed the exact composition of it to be as follows:

Silica	47·135
Alumina	5·790
Iron oxide	36 115
Magnesia	1·040
Phosphoric acid	1·850
Lime, Sulphuric acid	0·250
Water	7·820
	100 000

The value of this ocher as a basis for a hard and lasting paint was soon perceived, and it was not long before works were erected at the neighboring town of Ashburton for the manufacture of "silicate-oxide paint." This paint met with rapid success, especially in the War Office and Admiralty, and its manufacture was quickly extended, the process being as follows: The ocher is stamped as it comes from the mine with tin stamps in the usual manner, the liquid mud being pumped into settling-tanks, where it remains until dry enough to be dug out. One portion is then fully dried and crushed under heavy stone rollers, after which it is passed into a sifter, consisting of a fine wire gauze cylinder (with a mesh of sixty wires to the inch) in which revolves a series of brushes, at a speed of 500 revolutions to the minute, brushing the particles through the gauze. The material is thus reduced to an impalpable powder, in which state it passes to a pug-mill, where it is intimately intermixed with pure linseed-oil; thence it finally passes through a paint-mill, in which it is ground to perfect smoothness. The other portion of the silicate-oxide is calcined in a calcining-furnace before being treated in the manner explained above. By the first method of manufacture, the paste preserves the natural color of the ocher, which is a buff yellow. The calcining process gives it a dark-brown red color, such as is in general use for all kinds of iron-work. No pigments or coloring matters are used, the proprietors having wisely determined to manufacture and sell only their own natural product, without attempting to produce a variety of tints by the admixture of coloring matters that would diminish or destroy the preservative properties of the paint. The novelty of the silicate-oxide paint and its claim to superiority over the ordinary oxide paints, on the one hand, and the silicate paints, on the other, rest on the natural combination of silica and oxide of iron in its basis, which appears to have advantages not to be obtained by any mechanical admixture. The paint, when applied to iron, wood, stone, or stucco, presents an extremely smooth and hard surface, which stands exposure to heat, fresh and salt water, acids, and sulphurous gases.

A NEW ELECTRICAL SOCIETY.—The American Institute of Electrical Engineers has been organized in New York, with the following officers: Dr. Norvin Green, President; Vice-Presidents, Prof. Alexander Graham Bell, of Washington; Prof. Charles R. Cross, of Boston; Thomas A. Edison, George A. Hamilton, of New York; Charles A. Haskins, of Milwaukee; Frank L. Pope, of Elizabeth, Managers; Charles F. Brush, Cleveland, Ohio; William H. Eckert, Frank W. Jones, George B. Prescott, Prof. W. P. Trowbridge and Stephen D. Field, New York; Prof. Elisha Gray, Chicago: Prof. Edwin J. Houston, Philadelphia; C. L. Hillings, Key West: W. W. Smith, Indianapolis; Theodore N. Vail, Boston; Edward Weston, Newark; Treasurer, Rowland R. Hazard, New York; Secretary, Nathaniel S. Keith, New York.

PAVING-BLOCKS FROM FURNACE SLAG.—Among the new industries at Catasauqua, Pennsylvania, established some months ago, is that of the Lehigh Iron Stone Company, for the manufacture of paving and street blocks and bricks from molten slag from the Crane furnaces. The concern gives promise of success. The slag, instead of being allowed to harden in the furnace, to be carted away, is at once run into an immense crucible on a railroad truck, by means of which it is speedily transported to the casting-house, where, by means of suitable machinery, it is allowed to run into molds of various ornamental patterns arranged on a huge frame resembling somewhat the tread-power of a threshing-machine. The blocks are immediately after tilted from the molds into sand beds and suitably annealed by a slow process. The process of the manufacture is the invention of Charles Diebold.

CONTRACTIONS OF METRICAL UNITS.—The following contractions have been adopted by the International Metrical Congress at Paris, and are recommended for general use: (1) Length: Kilometer, *km*; meter, *m*; decimeter, *dm*; centimeter, *cm*; millimeter, *mm*. (2) Surface: Square kilometer, km^2; square meter, m^2; square decimeter, dm^2; square centimeter, cm^2; square millimeter, mm^2; hectare, *ha*; are, *a*. (3) Cubic measure: Cubic kilometer, km^3; cubic meter, m^3; cubic decimeter, dm^3; cubic centimeter, cm^3; cubic millimeter, mm^3. (4) Hollow measure: Hectoliter, *hl*; liter, *l*; deciliter, *dl*; centiliter, *cl*. (5) Weight: Ton (1000 kilograms), *t*; metric hundredweight (100 kilograms), *g*; kilogram, *kg*; decagram, *dkg*; gram, *g*; decigram, *dg*; centigram, *cg*; milligram, *mg*. Italic letters are used for these contractions, and no stop is to be used at the right of them. The contractions succeed the figures to which they refer on the same line, and after the last decimal placed, when figures are used that contain decimal fractions.

DUTY ON STEEL WIRE CABLE.—Referring to a letter by the Collector of Customs at San Francisco, in regard to the appeal of D. H. Jones against his assessment of duty at 4½ cents a pound on certain wire cable imported from Hamburg, the Secretary of the Treasury states that the cable was comprised of 12 strands of steel wire, gauge No. 13½, and 19 strands of steel wire, gauge No. 17, having a heart or core of hemp. It is stated that the article of chief value in the cable is the steel wire, gauge No. 13½. Paragraph 182 of the tariff of March 3d, 1883, provides that no article made from iron or steel wire, or of which iron or steel wire is the component part of chief value, shall pay a less rate of duty than the iron or steel wire from which it is made, either wholly or in part. Upon a reconsideration of the case, the Department decides that, if upon examination it shall be found, as alleged, that the component of chief value in the cable is steel wire, gauge No. 13½, the article shall be charged with the duty appropriate to that sized wire, with, of course, 2 cents a pound additional, under the concluding part of paragraph 182.

THE PRODUCTION OF GOLD IN RUSSIA.—What is claimed to be a correct statement of the output of gold in Russia during the past few years is given below, on the authority of the *Oesterreichische Zeitschrift*:

DISTRICT.	1880. Kilograms.	1881. Kilograms.	1882. Kilograms.	1883. Kilograms.
East Siberia and Amoor	29,214	24,944	25,049	23,959
Imperial works in Nertschinks and Altai	2,400	1,754	1,624	1,639
West Siberia	2,395	2,065	1,988	2,096
Ural	9,442	7,976	7,489	8,084
Finland	18	20	16	16
Total	43,469	36,759	36,116	35,795

One kilogram being equal to 32·151 ounces troy, the product of Russia in 1883 was 1,150,861 ounces.

A NEW PROCESS FOR THE REPRODUCTION OF DRAWINGS.—Although a great improvement was made in the ferro-prussiate process for the reproduction of drawings in giving blue lines on white ground, it was never quite satisfactory. It has now been superseded by a process that, indeed, requires a lithographic press for printing off the copies, but which otherwise is effected by means of the same apparatus as the "blue" copies. This process, which is now adopted by the Belgian department of Ponts et Chaussées, affords black lines in printer's ink on a white ground. A zinc plate is coated with Jews' pitch, thinned with organic acids. The tracing is placed over it in a frame with glass above, as in the ferro-prussiate process, and exposed to the sun. The pitch becomes hard except where protected by the black lines of the tracing. The plate is washed, which has the effect of removing the portions still soft that have not been protected by the lines. Acid is then poured over the plate, which bites into the lines, as in ordinary etching, and the plate is polished to give sharpness to the lines. Any number of copies may then be struck off with printers' ink, as in copper-plate printing. The plates may be prepared in the office, and sent to a copper-plate printer for the requisite number of copies to be struck off.

BROWN POWDER.—Krupp, the great gun-maker, has introduced a new kind of powder, which is deservedly creating quite a sensation among experts, inasmuch as it may lead to the disuse of the black powder. It is known under the modest name of brown powder, owing to its peculiar color, which resembles that of chocolate or cocoa, and owes its discovery to a mere accident. According to the reports on the trials hitherto made, the brown powder has a decided advantage over the black in producing a greater velocity with an equal pressure of gas, and being applicable to guns of every caliber. The remarkable fact about it is, that it explodes only in a tightly closed space, while in the open air or in the powder-box it ignites slowly without explosion, although it is said to consist of saltpeter, sulphur, and charcoal, like the black powder, the difference consisting in the relative proportions of these ingredients. It is supposed that the degree of carbonization of the wood from which the charcoal is made plays a prominent part in the new discovery, as the color of the powder seems to indicate; as also that the dangerous explosions in mixing and preparing it may henceforth be prevented. Of special strategic importance is the fact that the smoke of the brown powder is much thinner, and hence will more quickly disappear than that produced by the black powder. Trials are now making in all the larger artillery services on the continent.

THE CENTRAL PENNSYLVANIA BROWN HEMATITE ORES.—Mr. E. V. d'Invilliers, at a meeting of the Engineers' Club of Philadelphia, read a paper on Some Characteristics and the Mode of Occurrence of the Brown Hematite (Limonite) Ores in Central Pennsylvania, taking for his field of illustration the Lower Silurian limestone valleys of Center County. He described the anticlinal structure of these valleys, and the great erosion, aërial and sub-aërial, that these rocks (6000 feet thick) have undergone, influencing the position and character of many of the present ore-deposits. He applied this principle to the different ferriferous limestone beds, and explained how this effect was aided by the alternate rise and fall of the anticlinals along the trend of their axes. He noted three varieties of ore: 1st. The wash and lump hematite of the Barrens. 2d. The true limestone "pipe ore." 3d. An intermediate *transition* variety. The first is always associated with the sandy magnesian beds low down in the series of No. II., or below 5000 feet beneath the overlying Hudson River Slates of No. III. This class shows rounded ore and flint balls and tough, barren clay, being secondary or derived deposits of irregular shape. They have been tested 100 feet deep, and contain from 45 to 53 per cent iron and from ·051 to ·113 phosphorus. The almost total absence of bisulphide of iron is noticeable. Cost of mining is about $1.50 per ton. The *transition* variety was assigned a position in the formation from 3500 to 5000 feet below the slates. The ores characterized by a more calcareous clay, are compact, amorphous, liver-colored ores, containing from 40 to 49 per cent iron and from ·115 to ·365 per cent phosphorus. The *pipe ores* occur usually higher in the limestones than either of the other two, but in this county *below* the 400 feet of upper Trenton layers. These ores occur *in situ*, between parallel walls of limestone; in plate-like masses, scales, or as cylindrical pipes in bunches 8 or 10 feet long, while feathering out both in line of strike and dip. The deeper banks show the repeated occurrence of crystals of iron pyrites in all stages of metamorphism. They occur at great depths, and show from 45 to 53 per cent iron and from ·100 to ·185 per cent phosphorus. The flint or quartz grains accompanying them are rarely water-worn, and this clay is very calcareous and easily washed, not requiring the jigging necessary for cleansing the lower ores. Cost of mining these ores varies from 90 cents to $1.25 a ton.

FURNACE, MILL, AND FACTORY.

Messrs. Fairbanks, Morse & Co., of Chicago, have contracted with the Westinghouse Machine Company, of Pittsburg, Pa., to control the entire sale of the Westinghouse automatic engine in the Western States and the territories for a term of years. This contract, which is exclusive, takes effect July 1st, and being closed only after a thorough investigation as to relative merit, becomes a very practical indorsement of the engine in question.

The Midvale Steel Company, at Nicetown, Pa., contemplates increasing its capital by $250,000.

The Steubenville blast-furnace property was sold June 30th to a syndicate of Steubenville, Ohio, at two thirds its appraised value, $50,000. The works originally cost about $250,000.

In the Circuit Court of the United States, at Pittsburg, Pa., Judge Acheson has delivered an opinion in the case of Sebastian Stultz against Charles H. Armstrong & Son, ordering a decree to be recorded in favor of the plaintiff. The proceeding was a claim for the use of six coal-washing machines. The plaintiff had built two machines of his patent for the defendants, and was paid for them. Subsequently the defendants erected six more on their own account, and refused compensation to the patentee.

Four workmen employed by the Calumet Iron and Steel Company in Chicago, Ill., while engaged in cleaning one of the large chimneys connected with the works, July 3d, were suffocated by the gas.

The Clapp & Griffith Steel Company, of Pittsburg, Pa., has applied for a charter. The company has a capital stock of $100,000, and the directors are James P. Witherow, Henry W. Oliver, David B. Oliver, James B. Oliver, and George E. Tener. It is stated that the company has been operating a steel-works at the foot of Fifteenth street, South Side, Pittsburg, for some time, and that the establishment of a new works was not contemplated.

Work at the Keystone Bridge-Works, Pittsburg, Pa., is about to begin in full.

No. 2 of the Chestnut Hill Iron Ore Company's furnaces, situated in Columbia, Pa., has been fired up. Nos. 1 and 3 will in all probability be lighted about the middle of July. These furnaces have been idle for the past three years. They employ nearly 300 hands.

The Gem furnace, at Milnes, Va., on the Shenandoah Valley Railroad, is now out of blast for relining. Its three new Whitwell stoves are completed, and every thing about the furnace is getting into thorough repair. It is expected it will be ready to go into blast early in July, with a largely increased production.

The spike works of Dilworth, Porter & Co., at Pittsburg, Pa., are closed in nearly every department, on account of the remodeling of the heating-furnaces for the use of natural gas. The work is nearly completed.

The Metal Workers' Union of North America was organized at the convention of metal workers recently held at Philadelphia, Pa.

Cherrie & Co., of Chicago, Ill., dealers in pig-iron and rails, filed a voluntary assignment July 3d. The liabilities of the company are $350,000; the assets, nominally $750,000; and the actual at least $600,000. It is stated that the company will be able to pay in full and have a large surplus.

Andrews & Hitchcock, of Youngstown, Ohio, iron manufacturers and coal operators, July 3d, asked an extension from their creditors, which was granted. The firm will continue business.

Pennsylvania Furnace, at Graysville, in Huntingdon County, Pa., has been put in blast by the Center Mining Company, Limited. This furnace is one of the oldest furnaces in the State. Its product will be neutral coke pig-iron from hematite ore of the same quality as was used in former years in producing the celebrated Sligo brand of pig-iron. Mr. E. M. Valentine, 261 South Fourth street, Philadelphia, Pa., has been appointed sole agent for the sale of the product of the furnace.

The Pottsville, Pa., Iron and Steel Company, owing to the slackness of orders, has blown out its No. 3 furnace, throwing several hundred hands out of employment.

The contract for furnishing barb fence wire for the use of several Indian tribes for the current year has been awarded by the government to the Buck Thorn Fence Company of Trenton, N. J. About 250 tons of the wire will be required. The same company had the contract in 1883.

William A. Dunklee has been designated as the duly authorized agent in Colorado of the National Tube-Works Company.

The Clayton Steam-Pump and Air-Compressor Works, Brooklyn, New York, write: Orders at present in our works include a duplex air-compressor for sinking the caissons for a bridge in Arkansas; a compressor for a copper mine in Arizona; a full plant of air-compressing machinery for a California mine, including air-compressors, rock-drills, air-receiver, boilers, pipe, etc.; besides a number of orders for smaller air-compressors, brewers' duplex air-pumps, steam-pumps, etc.

The Hartman Steel Company, Beaver Falls, Pa., is enlarging the capacity of its works.

The furnace of Messrs. Ferguson, White & Co., at Robesonia, Pa., will be, when the present plans for enlargement are carried out, the largest single blast-furnace in the State. The improvements will not be completed until about October, and the capacity of the furnace will be double its present limit of 350 tons a week, or 700 tons.

The Jefferson Iron-Works, Steubenville, Ohio, have tried gas as a fuel in their nail department. Steam was raised from cold water in twenty minutes, and 100 pounds raised in fifty minutes. With coal, it requires two hours and thirty minutes to raise steam. The gas is supplied through numerous small jets, filling the furnace with a steady blaze. These boilers run 160 nail-machines and shears.

The interests of Wallace C. Andrews in the mills and furnaces of Andrews Brothers & Co. at Hazleton, and other properties in Luzerne County, Pa., have been attached by the sheriff.

The Newark Machine Company's works, Ohio, recently destroyed by fire, will probably be rebuilt. The town proposes to assist the company with funds.

LABOR AND WAGES.

Secretary Davis, of the State Miners' office, has issued a call for a miners' State convention to be held at Pittsburg, Pa., on the 23d inst. Questions of importance to the miners of the whole State are to be discussed.

The drivers in Niblock's mine, at Brazil, Ind., recently struck for $2 a day. They have been receiving $1.87½ since they started to work.

Skilled miners who have been directing the hydraulic mining operations in California are in demand in South Africa and Brazil. Their skill and experience in placer mining insure them liberal wages.

The Ohio Coal Exchange has decided to import Swedes and Hungarians to take the place of the 3000 men now locked out in the Hocking Valley, and to start the mining-machines.

The Philadelphia & Reading Railroad Company, July 7th, reduced the wages of its employés in the forge at Reading, Pa., as follows: Heaters and hammerers, from $3 to $2.25 a ton; helpers, from $1.75 to $1.40; and others in proportion. A number of suspended hands have been taken back recently, and it is expected that within a month nearly all of them will be at work again.

Dispatches from Pittsburg state that the continued importation of foreigners into the coal-fields of Clearfield, Bedford, Huntingdon, Jefferson, Cambria, Blair, Somerset, and other counties has aroused the most intense feeling among the native colliers. Largely attended meetings have been held to denounce the course of the railroad and mining corporations for bringing this element into the coal country. Secret societies are forming to drive the foreigners from the districts.

At a convention of the Plum Creek and Sandy Creek coal miners, Pennsylvania, July 8th, it was unanimously decided to demand three cents a bushel for mining.

RAILROAD NEWS.

The Norfolk & Western Railroad is now engaged in extending its New River division some four miles down Bluestone River, into Mercer County, West Va., along the lands of the Flat-Top Coal Company, and the eastern outcrop of the No. 3 or "big bed" of coal, the same worked at Pocahontas, a few miles to the southwest.

Mr. J. W. Hopkins, Fuel Agent of the Chesapeake & Ohio Railroad Company, sends us the following report of the total output and distribution of coal and coke received from the mines on the line of the railroad (including mines on the Lexington Division) for the month ended May 31st, in tons of 2000 pounds:

	For May.		From Jan. 1 to May 31.			
Kind of coal.	1884.	1883.	1884.	1883.	Increase.	Decrease.
Cannel	1,930	1,741	5,393	10,543	.....	5,150
Gas	27,607	35,867	135,355	155,370	.....	20,015
Splint and Block	3,808	8,229	29,715	45,715	.....	16,000
New River, etc	28,240	37,684	189,590	180,972	8,618	.....
Coke	4,357	7,763	23,006	48,373	.....	25,367
Totals	65,942	91,284	383,059	440,973	8,618	66,532

	For 31 days.	
Distribution of above:	1884.	1883.
Fuel for use of company	18,822	17,044
Shipped at Huntington, on Ohio River	.....	3,354
Delivered on line of Elizabethtown, Lexington & Big Sandy Railroad.	2,069	1,139
Delivered on line of Chesapeake & Ohio Railroad, excepting Richmond	12,765	12,834
Delivered at Clifton Forge to Richmond & Alleghany Railroad	124	786
Delivered at Staunton to Baltimore & Ohio Railroad	.....	.....
Delivered at Waynesboro' to Shenandoah Valley Railroad	31	20
Delivered at Charlottesville to Virginia Midland Railroad	4,779	2,566
Delivered at Richmond, Fredericksburg & Potomac Junction to Richmond, Fredericksburg & Potomac Railroad	.....	1,240
Delivered at Richmond for consumption, including tugs, dredges, etc.	7,524	12,697
Shipped at James River wharves	5,280	12,754
Delivered at Newport News for consumption, including tugs, dredges, etc	763	733
Shipped at Newport News wharves	13,785	26,117
Totals	65,942	91,284

A contract was closed at St. Paul, Minn., July 3d, with San Francisco parties to transport 10,000 tons of ore from Butte, Mont., to New York, via the Northern Pacific and the lakes to Buffalo and thence by rail. It will be the first large shipment by this route.

There will be considerable railroad work in Montana this year. The branch from Stuart station on the Utah & Northern and Anaconda (now a town of 1200 people) will soon be in operation, as the track is now laying. The branch from the Butte terminus to the Anaconda mine is in the same advanced stage of completion. It is tolerably sure that the Utah & Northern will also extend a branch from Dillon to the coal-fields of Gallatin County, and almost certain that a road will be built from Butte to Benton via Helena, and perhaps to connect with the Canadian Pacific. The Northern Pacific branch from Helena to Wickes is a success, and is kept busy handling the products of the Wickes smelters and contiguous mines.

Application for a receiver for the Denver & Rio Grande Railroad Company has been made at Denver, Colo.

The stockholders of the Pittsburg, McKeesport & Youghiogheny Railroad Company July 8th decided to issue $1,000,000 of six per cent bonds, to run fifty years, the proceeds to be devoted to the extension of the road.

The Atlantic & Pacific Coal Company has begun a suit at Denver, Colo., against the Atlantic & Pacific Railroad Company for damages amounting to $400,000. According to the plaintiff's claim, the defendant agreed to receive from it one hundred tons of coal a day at an agreed price, and the defendant agreed to construct switches from its main line to the plaintiff's coal mines, and in both particulars this agreement was violated. The railroad company denies that any such contract, valid in law, had been made, and that, even if such a contract had been entered into, it was subsequently abrogated by the making of a new contract that superseded the first one. The Denver *Republican* states that the evidence showed that a new contract had been made, and the indications are, that the railroad company will come off victor.

W. H. Jackson has been appointed receiver of the Denver & Rio Grande Railroad.

The Baltimore & Ohio Railroad Company has purchased the Pittsburg, Cleveland & Toledo Railroad. The terms of the sale are not known. This purchase insures the Baltimore & Ohio uninterrupted Western connections.

COAL TRADE NOTES.

ALABAMA.

The mines at Warrior Station are running along smoothly. Pierce's old shaft is running steadily, giving the miners a pretty good average of cars: the new shaft is shut down for a time. The inclined plane is expected to be landing coal by July; the machinery is all complete, with the exception of the dump, which will be completed in a few days. Hainey's is running steadily. Brake's mines are also running steadily. The new company is also progressing rapidly. It is driving the entries as fast as possible. The men are working steadily, double shifts. The company has also put up a number of houses.

COLORADO.

Several of the smelters are becoming alarmed over the prospect of a coke famine, says the Leadville *Herald*. The supply of coke in Leadville is very limited, and the torrent now raging through the Royal Gorge, suspending transportation over the Rio Grande Railroad, has shut off further supplies. With the rebuilding of the washed-out portion of the Rio Grande road, near Pueblo, it may be possible to secure coke by way of Denver over the South Park road. Owing to the suspension of traffic through the Royal Gorge, the American Company is unable to get charcoal to its Cañon City works or a temporary supply of coke from its Cañon City stock for the Leadville smelter, and the Leadville works are now run principally with charcoal, while the Cañon City establishment is depending largely on coke for fuel.

CONNECTICUT.

The recently discovered Wallingford Coal District, which lies in a deep creek on the Slocum farm, in the town of Durham, it is thought will prove a mine of wealth. A number of New Haven and New York capitalists are interested in it. Prof. W. P. Blake, of New Haven, has been investigating the mineral and the lay of the land. He found an elongated basin about the creek, filled with dark rocks, in marked contrast with the red sandstone found in the region about New Haven. This dark rock is anthracite shale, and is a feature in the coal regions of Pennsylvania. Professor Blake had taken a week to make tests. If his report justifies the expenditure of a large sum of money in opening the mines, a diamond drill will be purchased and a joint-stock company organized, with William S. Walls, an old Pennsylvania miner, T. Davies, Professor Blake, and G. W. Hull as the principal owners.

MARYLAND.

Reports from Frostburg for the week ended July 3d show the following: Borden mine is idle, owing to a break in the canal. Alleghany, New Hope, Blaen Avon, and Shaft, half-time. Midlothian, idle—mine worked out. Eckhart and

Hoffman, half and three-quarter time. 'Coney old mine, 22½ days in June; at present, full-time. New 'Coney, the same. Koontz mine, full-time. Jackson mines, full-time. Detmold mines, full-time. Pekin, full-time. Potomac, full-time. Swanton, loading from six to eight hoppers a day. Franklin, Phœnix, and Hampshire, half-time.

PENNSYLVANIA.

N. Ferree Lightner, of Philadelphia, coal dealer, announced, July 1st, his inability to continue business, and made an assignment for the benefit of his creditors. It is estimated that the liabilities are about $20,000 and the assets $8000.

ANTHRACITE.

The difficulty between the Philadelphia & Reading Coal and Iron Company and John R. Davis, concerning the Ellsworth colliery, has been satisfactorily adjusted, and arrangements made by which Mr. Davis will continue the working of the colliery.

The Susquehanna Coal Company will soon erect at a point near Nanticoke a large chute, which will be utilized in the screening of culm at one of its large dump-piles.

Preparations are making by the Susquehana Company for the construction of a new breaker at its new shaft in Newport.

Work has been suspended indefinitely at Mine Hill Gap colliery.

The Buck Mountain vein has been struck in good condition at Merriam colliery.

BITUMINOUS.

M. M. Dick, of Sewickley township, Westmoreland County, has transferred to the Penn Gas-Coal Company the coal under fifty-six acres in that township for $11,865.

COKE.

The Coke Producers' Association has decided to close down on all ovens in the Pittsburg region, hereafter, two days a week. This move is considered necessary, owing to the depressed state of the coke trade.

The Port Royal Coal and Coke Company has shipped its first car of coal at its new shaft on the Pittsburg, McKeesport & Youghiogheny road.

The Mount Braddock coke-works will be sold at public sale by the assignee, George H. Anderson, July 25th.

NATURAL GAS.

The gas-well that is drilling by Agnew & Co., glass manufacturers, at Hulton, on the Alleghany Valley Railroad, is over 200 feet deep.

Chess, Cook & Co. have begun to sink a gas-well at their works on Nineteenth street, South Side, Pittsburg. Several other manufacturers on the South Side will, it is said, follow suit within a short time. The work of drilling on the Franz farm in Lower St. Clair township, by the South Side Gas Company, has been commenced.

VIRGINIA.

A syndicate composed of B. K. Jamison, ex-Governor Henry M. Hoyt, J. W. Jones, ex-president of the Buffalo, New York & Philadelphia Railroad Company, and several Englishmen, has been formed in Philadelphia, with a capital estimated at $2,500,000. These gentlemen have secured 100,000 acres of coal and timber lands in Smith and Tazwell counties. These will be developed, and a railroad is to be built from the lands to the Ohio River. A short line is to be built thence to connect with the Marietta, Cincinnati & Ohio, giving an outlet for the coal to a number of prominent Ohio towns. These gentlemen also contemplate building a line from their lands into Kentucky.

WEST VIRGINIA.

The Peerless coal mine, situated between Slaughter and Fields's creeks, on the Chesapeake & Ohio Railroad, Kanawha County, has just been leased by Messrs. Hale & Hallwood, of Charleston. The coal from this mine, which was formerly known as the Houston, is said to be one of the best gas-coals in the Great Kanawha field. It is rich in volatile matter, and has a high candle-power, while the coke made from it is excellent.

About 1000 acres of the lands of the Flat-Top Coal Company have been leased. The royalty paid by the lessees is 12½ cents a ton. It is stated that other parties are negotiating for leases, and the indications are, that the New River Division of the Norfolk & Western Railroad will be at once extended down to and up Crane Creek.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY—TOMBSTONE DISTRICT.

The miners' strike has now lasted for two months, and it seems, according to the *Epitaph*, that the mine-owners are as strong as ever in their determination. It is stated that the day has passed when even a compromise at $3.50 could be effected. The mines of the Tombstone, Contention, Grand Central, and other companies are still shut down.

TOMBSTONE.—The yearly report of the superintendent, Prof. John A. Church, is now in the printer's hands.

GRAHAM COUNTY.

ARIZONA COPPER.—It is stated that the company is now on a solid financia basis, the indebtedness on the railroad and the amounts due to the parties from whom the mines were purchased having been settled.

PINAL COUNTY.

CASA GRANDE.—The furnaces, pumps, engines, and all other machinery necessary for the reduction of the Copperosity ore have arrived. The company's mines are said to be looking well.

PINAL CONSOLIDATED.—The company has made an assignment of its personal property to the Anglo-California Bank, and the latter has appointed Mr. D. Henderson, of Globe, agent to dispose of the property and pay off the company's debts. The mines have turned into milling properties, and they will have no further use for the smelter.

POORMAN.—The mine has been sold for $12,000.

YAVAPAI COUNTY.

THREE SISTERS.—This mine, recently purchased by parties interested in the Black Warrior mine, is in bonanza, the ore-body turning out from 120 to 150-ounce ore. The ore is worked at the Black Warrior mill. A lot averaged 165 ounces a ton. Between 100 and 200 tons of high-grade ore are out and ready for the mill.

CALIFORNIA.

BUTTE COUNTY.

SPRING VALLEY HYDRAULIC GOLD MINING COMPANY.—According to reports from San Francisco, suit has been brought in the Circuit Court there by Charles Waldeyer against this company to recover $17,000, alleged to be due on mortgage bonds, for which plaintiff contracted in October, 1882.

MONO COUNTY—BODIE DISTRICT.

Reports for week ended June 30th:

BODIE CONSOLIDATED.—During the past week, 500 tons of ore were shipped to the mills. The average assay value of the pulp was $12.85, and that of the tailings $1.85. The Bodie mill finished crushing ore on Friday morning. The rich ore above the 306-foot level has pinched out. No change to note in any other place in the mine.

CONSOLIDATED PACIFIC.—The work of developing the mine continues. The Fortuna lode, near the west side-line of the Bodie, and not far from the Consolidated Pacific ground, extends northwesterly, and crosses the Consolidated Pacific some little distance north of the main working-shaft. It is reported that, from surveys just completed, it has been ascertained that this lode can be cut in the Consolidated Pacific ground with a reasonable outlay of money, and work to this end has been ordered, and the progress made, with results, will be made known. The work of developing the mine was carried on with a full force of men till some time after the middle of the year 1882, when operations were temporarily suspended. In the year 1883, the mine was worked for several months, and some good ore taken out.

STANDARD CONSOLIDATED.—Extracted and shipped to the mill 594 tons of ore. Received 1750 of crude bullion on the two weeks' run, and shipped to the company $13,975.88.

NEVADA COUNTY.

NORTH STAR MINING COMPANY.—The directors, at a recent meeting, passed a resolution tendering the North Star Gold Mining Company (the owners of the mine, etc., of that name) 60,000 shares in full payment of its mine and other property owned by that company, provided it would erect at its own expense suitable hoisting and pumping-works at the mine, and deliver with the mine the works complete; or, in lieu of erecting new works, the new company agreed to accept the buildings, machinery, tools, fixtures, and all property (except mine) belonging to the Scotia Gold Mining Company of New York. The directors of the North Star Gold Mining Company have accepted the proposition, and expect to deliver to the new company the Scotia Company's plant; failing so to do, it will erect works at the mine. When they are completed, the new company will take possession.

PLUMAS COUNTY.

CRESCENT.—The mill is running on custom ore.

FOREST KING.—The ledge has been reached. The tunnel is 100 feet in length, and the backs are 60 feet. The ledge is five feet wide, between well-defined walls, and pitches at an angle of about 70 degrees. The character of the ore is the same as the croppings of the ledge, except that it is a little harder, and it prospects equally well. The owners expect to begin milling the rock as a test within a month.

GREEN MOUNTAIN.—The uprise in the mine is through to the fifth level. All of the stamps will soon be running. The main tunnel will be driven ahead.

HALSTEAD.—Ore yielding $75 a pan is reported to have been taken out of the tunnel.

OLD ELLIS.—It is believed that this property, with the expenditure of some capital, would become one of the best in the Greenville District.

SAN BERNARDINO COUNTY.

BONANZA KING CONSOLIDATED.—Four bars of bullion valued at $7253 and five bars valued at $7948 were shipped on June 12th and 24th.

SIERRA COUNTY.

BLACK JACK.—Arrangements are making preparatory to starting up this mine, the property of J. B. Johnston, of New York City.

CANADA.

PROVINCE OF ONTARIO.

Some valuable discoveries in gold, silver, platina, and cinnabar have been made by prospectors some two hundred miles back of Kingston.

One of the most important discoveries of mica yet made is in the township of Villeneuve, Ottawa County, within two and a half miles of the Rivière du Lièvre. A party of miners has begun to open up one of the veins, and it is said it developing most satisfactory.

COLORADO.

BOULDER COUNTY.

CARIBOU.—The mine is full of water.

CENTURY.—The company is working the Melvina mine at Salina, under a lease. The low-grade ore is concentrated at the company's mill.

DIRIGO.—The tunnel is steadily pushed ahead under the mountains south of Four Mile Creek, and toward the Yellow Pine. A depth of nearly 900 feet has been reached. It is expected the New Enterprise will be cut in a few feet more. The Dirigo Company owns ten or fifteen good lodes beyond the New Enterprise.

NATIVE SILVER.—The company is pumping out the water from the mine. The shaft is over 300 feet deep, and levels have been run at 100, 200, and 300 feet. Some stoping has been done on the 200-foot level.

POORMAN.—This mine, at Caribou, is working 20 men on day's pay and leases. About 100 tons of high-grade ore that will average $300 per ton have been taken out since December last.

SILVER STAR.—Preparations are making for the erection of hoisting machinery. The ore runs from 100 to 400 ounces silver. The shaft is 90 feet deep. The levels are at 50 and 90 feet, and in about 50 feet each way. No stoping has been done.

CHAFFEE COUNTY.

CALUMET.—At this iron mine, the shipments are but five cars a week, merely enough to keep the nail mills of the Colorado Coal and Iron Company going, that being the only portion of its iron-works that are kept moving. There are 4000 tons of ore on the dump ready for shipment. The principal work done now is timbering and prospecting. The present capacity of the mine, if worked with a full force of men, is forty cars a day, or about 500 tons of ore.

LITTLE HOPE VS. COLORADO SMELTING COMPANY.—A suit has been commenced by the owners of the Little Hope mine, in the Monarch Mining District, against the Colorado Smelting Company. The smelter company some time since purchased the Madonna and Cherubim mines, which directly adjoin the Little Hope. In working the former mines, the latter claims that the drifts have extended over its boundary lines and over $500,000 worth of its ore have been taken out. Several efforts have been made to compromise the case, one being an offer of $50,000 by the smelter, but it was declined. At present, an application is to be made for an injunction against the further working of certain drifts that are said to extend over the line, and that an underground survey be made.

CLEAR CREEK COUNTY.

Considerable damage has been done by Clear Creak. At Idaho Springs, the dam below the sampling-works was carried away, and the old Sunshine mill deprived of any further supply of water until the dam is rebuilt. The flume from the dam to the mill has been the cause of a great deal of annoyance and litigation, and there is a question whether it will ever be rebuilt.

The Georgetown Public Ore Market is doing a rushing business, and, according to local papers, is treating a large amount of ore.

CROWN PRINCE.—This mine, at Empire, recently purchased by Denver parties, will be started up soon.

LEONARD.—The mines now known as the Leonard claims, situated on Sher-

man Mountain, in Griffith Mining District, in the very midst of the richest mines in the State, three miles from Georgetown, are offered for sale.

POLAR STAR.—Major Fulton intends to resume work on this lode soon.

SEVEN-THIRTY.—General Hamill is said to have instituted proceedings against the owner of this mine for $50,000.

DOLORES COUNTY.

The manager of the Durango smelter offers to treat Rico ores for from $8 to $10 a ton, and is very desirous of obtaining them, as they contain so many valuable fluxing properties, and for this reason can be the more readily mixed with the ores of Silverton, Red Mountain, and other camps.

GILPIN COUNTY.

DAISY.—The company has purchased the 15-stamp mill of the Golden Flint Mining Company, and will work the Daisy vein through the cross-cut north from the Pesigo vein, driven by it last year.

GERMAN CONSOLIDATED.—The company has made connection from the Bates-Baxter main shaft with the workings of the German mine, through the 350-foot level, which strikes the incline of the latter shaft at the depth of 700 feet. It now has plenty of air. A winze is also sinking to connect with a lower level, when a larger force of miners will be put on, the present number being 125. The company has under advisement the building of a tramway from the German down the mountain side for tramming stamp-mill dirt and smelting ore to Packard Gulch.

GUNNISON COUNTY.

LAST CHANCE.—A vein of ore twenty inches in width, carrying ruby and brittle silver, and running 400 ounces in silver per ton, has been discovered in this mine at Irwin. The lode runs parallel, and is located three hundred feet southwest of the Forest Queen.

LAKE COUNTY.

The Leadville *Herald* reports the following:

Mr. J. B. Henslee, agent for the purchase of ores and iron for the Morgan and Germania smelters of Salt Lake City, states that the demand for good iron ore is as great as ever. The Leadville iron ore is the only suitable fluxing iron, carrying silver, within reach of the Salt Lake smelters, and they are consequently paying fair prices for it. Mr. Henslee is now offering the following rates on iron, less freight charges, which are $6 a ton:

For ore carrying 45 per cent excess in iron over silica, $2 a ton.

For ore carrying over 45 per cent, 10 cents for each additional unit.

Ten cents per unit deducted on ore containing less than 45 per cent.

For silver in iron ore, $1 an ounce is paid.

AMIE.—Lessees of the south shaft, it is reported, have struck several feet of fine ore.

A. Y.—The mine has disclosed another productive ore-chute, from which it is possible that as much ore may be extracted as there was from old workings of the mine to the southward. The ore-body as yet is but imperfectly opened. The ore shows a thickness ranging from one to seven or more feet, and returns give it a value of from twenty to fifty ounces in silver to the ton.

COLORADO NO. 2.—The mine is receiving coal and making other preparations for resuming work, or at least starting up its machinery.

COLORADO & UTAH SAMPLING-WORKS.—The contract to build the works at the old Tabor mill-site has been let, and work has begun.

JESSIE C. VS. OPULENT.—Proceedings have been instituted at Denver, by the owners of the Jessie C. lode, for a restraining order against the Opulent mine.

MATCHLESS.—A contract has been made with the Arkansas Valley smelter for the ore output of this mine, for six months from July 1st. The product of the Matchless has heretofore been going to the Eilers smelter, at Pueblo.

MORNING AND EVENING STAR.—The companies are receiving bids for the treatment of their ores, their contract with the Omaha and Grant Smelting Company having expired July 7th.

RUBY.—Work has been suspended. The men have not received their pay for several months.

TWIN LAKES HYDRAULIC COMPANY.—The new Cash Creek working flume, 36 inches wide and 8200 feet long, is completed and in working operation.

WATERLOO.—This company will soon begin work.

LAS ANIMAS COUNTY.

TRINIDAD CEMENT AND MINING COMPANY.—For the purpose of manufacturing cement, lime, coal plaster, coke, fire-clay, graphite, earth paints, building-brick, fire-brick, tiles, stoneware pipe, and other articles, this company has been organized with a capital of $100,000. The practical man in this enterprise is Mr. Shane, of Rockland, Maine, whose cement-works there have been shut down on account of the removal of the tariff, and it is probable that the entire plant will be brought to Trinidad.

PARK COUNTY.

LONDON.—The mine owned by this company and the London, South Park & Leadville Railroad, which runs from the mine to the junction, were sold at London Junction, June 28th, under an execution in a suit brought by John T. Herrick against the company. The mine was bought in by Samuel N. Wood, of Denver, for $36,067.69. He also purchased the railroad property. The sale, it is stated, was more a matter of form than any thing else.

PITKIN COUNTY.

The Arkansas Valley Smelting Company and the American Smelting Company of Leadville have opened an ore market at Aspen.

SAN JUAN COUNTY.

BUCKEYE STATE.—The Mose Emery, on Bonita Mountain, is developing by this company.

SUMMIT COUNTY.

EL CAPITAN.—The owners have contracted with the McClelland mill for the treatment of 200 tons of ore from their mine.

IRON HILL CONSOLIDATED.—A car-load of ore netted $2270. The mineral was extracted from the quartzite.

CONNECTICUT.

A gold-bearing quartz has been found in Guilford, to the east of New Haven, in large and paying quantities. There is much excitement over the find.

DAKOTA.

CASTLE CREEK HYDRAULIC COMPANY.—This company is now in good shape, and work on the mine will be prosecuted vigorously.

FATHER DE SMET.—Reports for the week ended June 22d show ore extracted from the first, second, and third levels, 1960 tons. Ore milled, 2010 tons. Tramway header advanced 7 feet. Header in 43 feet. Reports for the week ended June 28th show ore extracted from the first, second, and third levels, 2735 tons. Ore milled, 2700 tons. Tramway header advanced 8 feet. Header in 51 feet.

IDAHO.

The shipments of ore and bullion from Hailey at present run from two to five car-loads a day, and in a week or two the shipments will probably be double what they are now.

CASTLE CREEK & HOLYOKE.—The properties are in a good condition, and active preparations are making to increase the output of bullion.

EUREKA.—A set of hoisting and concentrating machinery for the mine has been ordered, and as soon as the machinery arrives, work will be resumed. This mine has been closed down for seven or eight months.

MAINE.

DEER ISLE.—The directors have issued a circular from which we take the following: A new company has been organized called the Deer Isle Company. The Deer Isle Company has purchased the property formerly owned by the Deer Isle Silver Mining Company, and also the property formerly owned by the Deer Isle Consolidated Mining Company, all containing about fifty acres and covering all the territory upon or under which the Deer Isle vein is to be found in extension or dip. By the union of these two properties, all future questions as to encroachment are avoided, and ample facilities for economical working of the vein by two or more shafts are provided. It has been universally conceded that the great body of ore lies south of the old company's workings and under the property purchased of the Deer Isle Consolidated Company. It is a well-known fact that a large body of ore exists in the two properties. The ore is massive, requiring no dressing, except to break off the attaching rock, and several working tests in large lots of several hundred tons have been made of the ore, and it is found to average over 33 per cent zinc and 14 per cent lead, running fairly in silver, but not enough to work exclusively for it. For two years, there has been a new outlet for this class of ores, owing to the failure of the zinc mines in Pennsylvania to supply the demand of late created, so the Deer Isle ore is wanted at a price that it will pay to develop and produce it, the Deer Isle ore running higher in zinc than many of the ores that smelters are now using. A contract has been made with the Lehigh Zinc and Iron Company for the delivery and purchase of 300 tons of ore a month, delivery to begin six months from date of contract, at the price of seven dollars a ton, delivered on board vessel at Deer Isle. The expense of mining and shipping will not exceed three dollars a ton, giving a net profit of four dollars a ton. The mine is now pumped out, and a large force of men will at once be put at work. The contract is for the entire output of the mine, if an excess of 300 tons per month should be produced. The conditions of the contract call for no forfeiture, while the company on its part is bound to take all produced. The consolidated shaft, now down vertically (not on incline, as the old Deer Isle) 80 feet, is to be sunk to a depth to make connection with the old shaft, thereby giving a good working-shaft, and opening new and unexplored ground; work in the old shaft will be continued and ore taken from both; machinery will be provided to do the work as rapidly as possible. The money to carry out this project, while it is not unlimited, is believed to be sufficient till an income is got from sale of ore.

MEXICO.

American capital is developing the mineral district near Monterey known as Villa Aldama. The first company organized for the purpose was the Anglo-Texas-Mexicana. New York and Philadelphia investors afterward became interested. Results have been so satisfactory, says the *Financier*, that preparations are going forward for operations on a very extensive scale. Smelting-works have been erected at Guadalupe, and a railroad built for carrying the ore from the mountains, and many other obstacles have been overcome.

LAS NUEVAS MINAS DE SANTA MARIA.—The order for the examination of Henry Clews before trial in a suit brought by Eliphalet Mott against Henry Clews, Frederick Grant, John B. Alley, Las Nuevas Minas de Santa Maria Gold and Silver Mining Company, and others, was vacated by Judge Van Brunt of the Supreme Court, July 1st. The suit was begun about two years ago, and the complaint charges the individual defendants and the trustees of the company with improper disposition of the $25,000,000 capital stock of the defendant mining company. The mining property is alleged to be of little or no value, and the plaintiff also asks for an accounting.

NEW JERSEY & SONORA REDUCTION COMPANY.—At Nacasari, in the State of Sonora, this company recently started up its two thirty-ton water-jacket copper furnaces. The matte is high-grade in copper and silver, and can be produced for five cents a pound.

The correspondent of the Mexican *Financier* reports from Pachuca that much excitement has been created throughout all the mining camps in this district concerning the great Santa Gertrudis mine. The semi-annual meeting of the shareholders will soon take place, and some of the officers are looking forward to it with grave fears. In case the board of directors should be changed, very likely the new board will discharge several of the highly paid employés, in order to be able to pay a dividend. If this is not done, it is the opinion of several shareholders that an assessment on the shares will be made. It is calculated that the mine is yielding three thousand *cargas* a week, of a value of from 8 to 10 dollars a carga. In case this product should decrease in value, it would not be possible to meet the demands of the pay-rolls. This mine is divided into 25 shares, one of which is owned by the government. Each share is sub-divided into 80 *bonos*.

At the La Blanca mine, a large station has been cut out at the bottom of the shaft, and operations will be commenced on the cross-cut to the northwest, so as to cut the Santa Gertrudis lode. At the bottom of the shaft, the water has diminished, and it is hoped that the driving in the cross-cut will be expeditiously accomplished. The prospect is good. Several experts have examined the mine thoroughly.

At the Hidalgo California mine, rich specimens of rock have been extracted from the Encarnacion winze, with occasional patches of coated native silver. The lode is 6 feet wide, and appears to be increasing in width. They have not yet begun cutting on the south end cross-cut, but must be very near to the great Santa Barbara lode, which it is expected will be reached in 6 meters in ground of $60 per meter. The drilling has been done only with hand labor. The rock is very hard.

MICHIGAN.

COPPER MINES.

The following figures represent the June output of the mines mentioned:

	Tons.
Calumet & Hecla	2096
Atlantic	187
Franklin	175
Huron	108
Allouez	100
Peninsula	60
Wolverine	45
Hancock	38

CALUMET & HECLA.—Mr. Chauncey Clapp has been elected Vice-President.

OSCEOLA.—The south end of the mine is looking unusually well.

TAMARACK.—The shaft has lately encountered a bed of hard trap rock that makes progress downward less rapid than usual. The depth is, however, 1500 feet. The examinations making around Dollar Bay by the company's engineer have given rise to the rumor that, when the time arrives for locating a mill for treating Tamarack rock, it will be built at that point. It is stated that the choice of a site for dressing-works is between the shore of Lake Superior and Dollar Bay.

IRON MINES.

CHAPIN & LUDINGTON.—These mines are supplied by the Hydraulic Power Company with compressed air to drive their pumping and hoisting machinery.

PITTSBURG & LAKE SUPERIOR.—This company is meeting with the most gratifying results in the operation of its diamond drill. In five holes bored, all show ore, and there is no longer any doubt as to the continuance of the iron deposit at the Palmer. The President, Mr. Bagley, of Philadelphia, is at the mine, and will soon decide what course the management will take in regard to developing the property.

SILVER MINES.

Parties from Milwaukee have furnished the necessary funds to develop the Iron River silver properties. They have purchased the Ontonagon Silver, the Scranton, the Mammoth, and the Superior Silver mine, and it is the intention to proceed at once to put the buildings and machinery in good repair.

MONTANA.

LEWIS & CLARKE COUNTY.

EMPIRE.—The owners of this mine have purchased the Whippoorwill 10-stamp mill, and will put it to work at once.

SILVER BOW COUNTY.

The silver mills of Butte are all in operation, working their full complement of stamps, and are daily reducing ore as follows: Alice, 90 tons; Lexington, 50; Silver Bow, 30; Moulton, 45; Dexter, 28; Old Lexington, 10; total, 253 tons.

An important enterprise, which will add greatly to the reduction capacity of the district, says the Butte *Miner*, has been inaugurated by Franklin Carroll and A. F. Migeon, of the Parrott Company, in the construction near the Parrott smelter of a blast-furnace, with a capacity of 150 tons per day, with a concentrator and six calcining-furnaces. The buildings for the concentrator and calciner are rapidly progressing toward completion, the former being 40 by 110 feet on the ground and the latter 83 by 200 feet. Work will be commenced at once on the blast smelter, and it is the intention to have the works in operation by August 1st. The new smelter will reduce ores from the Parrott and Parks mines, and the plan of the promoters includes the purchase of ores from other mines.

ALICE.—The Butte *Inter-Mountain* says that it is stated that arrangements have recently been made for the liquidation of the indebtedness, which now amounts to $200,000, by small payments made at the company's option covering a period of four years. Walker Brothers say they will only charge 4 per cent.

LEXINGTON.—The production during June is reported to be a little over $90,000. The decrease is accounted for by the fact that no free ore was extracted, and the old 10-stamp mill as a result was not in operation. The mine is looking fully as well as usual in all its workings, the 400 and 500-foot levels producing about 50 tons of ore a day from fine ore-bodies. The cross-cut south from the 650-foot station has been advanced 65 feet, but the ledge has not yet been encountered.

MONTANA COPPER.—The company has begun the development of a claim embracing a section of the great Parrott lode and near the claim of the Parrott Company. The sinking of a three-compartment shaft has been started, and it will be sunk to the depth of 300 feet. The claim lies between mines of ascertained richness and extent. Whether the product will be shipped in a crude state or reduced at the company's smelter will be determined after exploration has shown the quality of the ore.

NEVADA.

ELKO COUNTY.

NAVAJO.—Work in the chambers on the "west" vein continues to develop a large amount of low-grade ore.

EUREKA COUNTY.

GEDDES & BERTRAND.—Parties who have examined the property state that it is worth continued prospecting 1000 feet, for the reason that no such surface developments could be made independently of a great mine below. It is thought that with deeper prospecting larger chambers of ore will be found to yield an ample supply for keeping the mill at work. The company has also been advised to work more custom ores.

MOREY.—This property, which is owned by New York capitalists, comprises 19 parallel claims, well-defined ledges, in granite formation, held under nine United States patents. A tunnel has been run in 1500 feet, and when it is extended in 450 feet farther, it will strike one of the principal veins, the American Eagle, at a depth of 300 feet. From this point, an incline will be sunk on the ledge. The tunnel is run in such a way as to be connected readily with the other two chief lodes, the Magnolia and the Monitory; and all ore will be transported through it directly to the ore-house at its mouth at the least cost possible. The ore in all the deposits is of high grade, running from $200 to $500 a ton. There is an abundance of water and wood for all purposes, and there is also a good ten-stamp mill on the ground, with roasters. The ore is chlorides to a depth of 50 feet below the surface; but deeper down, very rebellious ruby silver is encountered. It is not so rebellious, however, but that it can be economically reduced at the mill with the aid of a Brückner furnace. This property is situated some 72 miles south of Eureka.

STOREY COUNTY—COMSTOCK LODE.

A strike has been made in what is known as the "Jones lease" of the Bonanza mines. The ore found on the 1200 level has proved to be of excellent grade. The deposit was found in the new drift run from the Consolidated Virginia line, near its junction with the old drift on the 1200 level. The new drift is now headed for the Consolidated Virginia shaft, with which a connection will be made. For years, many miners and others on the Comstocks have contended that ore existed at this point.

At the Combination shaft, the Cornish pump on the 2900 level has started up and works splendidly. At present, the influx of water is sufficient to keep it runnning about two or three hours a day. It is rumored that sinking to the 3000 level will be resumed.

Regular bullion shipments are made from the Yellow Jacket, Kentucky, Crown Point, and Belcher mines. A larger force of miners is at present employed at these mines than at any other point on the lode.

UTAH.

The receipts of bullion (excluding ore) in Salt Lake City for the six months ended June 30th, inclusive, aggregated $2,389,960.

VIRGINIA.

AUGUSTA COUNTY.

VIRGINIA MANGANESE COMPANY.—The Crimora manganese mine produces a high-grade manganese ore, from which this company realizes, it is stated, a royalty of $2 per ton.

ROANOKE COUNTY.

CHAPMAN.—The following analyses of ores from these mines, also known as the Poor Mountain mines, on the Norfolk & Western Railroad, were made by the chemist of the Crozer furnace:

	No. 1.	No. 2.	No. 3.
Insoluble residue	26·39	21·14	13·34
Metallic iron	43·22	45·30	51·84
Phosphorus	1·11	0·82	1·36
	70·72	67·26	66·54

o. 1 was from the upper or eastern cut; No. 2 from the middle; and No. 3 from the western or field cut.

WISCONSIN.

In what is known as the Penokee region, through which the Central Railroad runs, representatives of a large iron company, organized by Milwaukee and Eastern capitalists, have been busy prospecting along this range, and are so well satisfied with their discoveries that before next season, it is stated, mining work will be begun a few miles east of the main line of the road, smelting-works erected, and iron production started on a large scale. The Penokee range yields what has been decided to be the very best quality of Bessemer ore.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED MAY 6TH, 1884.

298,028. Open-Hearth Steel-Melting Furnace. Charles M. Ryder, Chester, Pa.
298,093. Furnace-Grate. Omar H. Jewell and William M. Mathisen, Chicago, Ill.
298,119. Utilizing the Exhaust of Engines. David Renshaw, Braintree, Mass.
298,149. Process of Dissolving Metals in Ammoniacal Solutions. Charles Romley Alder Wright, 3 Castillain Road, Maida Vale, County of Middlesex, England.
298,203. Cooling-Shield for Puddling-Furnaces. Edwin W. Hickman, Bay View, Wis.
298,208. Pump. John G. Irving, Markdale, Ontario, Can.
298,224. Flanging-Machine. Thomas R. Morgan, Sr., Alliance, Ohio.
298,230. Rotary Meter. John A. Peer, Grass Valley, Cal., Assignor of one half to John J. Berger, Brooklyn, New York.
298,248. Combined Drill and Countersink. Albert J. Smart, Greenfield, Mass., Assignor to the Wiley & Russell Manufacturing Company, of Massachusetts.
298,251. Pipe-Casing for Submarine Rock-Drills. Charles A. Sterling, New York City.
298,281. Asbestos Compound, and Articles made therefrom. Charles F. Brigham, Worcester, Mass., Assignor of three fourths to D. Austin Brown, Trustee.
298,282. Fire and Water-Proof Material for Roofing, etc. Charles F. Brigham, Worcester, Mass., Assignor of three fourths to D. Austin Brown, Trustee.
298,297. Regenerative Furnace. John W. Galvin, Portsmouth, Ohio, Assignor of one half to Levi D. York, same place.

REISSUE.

10,475. Steam-Pump. George McFeely, Steubenville, Ohio, Assignor to William J. Sherriff, Pittsburg, Pa.

GRANTED MAY 13TH.

298,370. Bell and Hopper Mechanism for Blast-Furnaces. Frederick W. Gordon, Pittsburg, Pa.
298,387. Automatic Shelf-Feeder for Middlings-Purifiers, and Rolling-Mills. William M. Jewell, Denver, Colo.
298,426. Furnace for the Manufacture of Metals directly from the Ore. John A. Stearns, Johnstown, Pa.
298,435. Steam-Pump for Portable Steam-Engines. William C. Wolfe, Hagerstown, Md.
298,443. Apparatus for Dredging, Crushing, and Washing Phosphate-Rock. Frederick Brotherhood, Charleston, S. C.
298,444. Means for Loading Vessels with Phosphate-Rock, etc. Frederick Brotherhood, Charleston, S. C.
298,457. Hand-Drill. Isaiah M. Furbish, Augusta, Me.
298,492. Rotary Blower. John L. Newman, West Point, Ga., Assignor of one half to Thomas J. Eady, same place.
298,596. Steam Pumping-Engine. Joseph L. Lowry, Pittsburg, Pa.
298,606. Hoisting-Bucket. George H. Miller and Casimir Goyette, Pawtucket, R. I.
298,625. Carriage for Rock-Drills. William L. Saunders, Jersey City, N. J.
298,642. Manufacturing Wrought-Steel. Samuel T. Wellman, Cleveland, Ohio.
298,661. Compression Apparatus for Casting Steel Ingots. George W. Billings, Cleveland, Ohio.
298,662. Method of Fouring and Compressing Steel Ingots. George W. Billings, Cleveland, Ohio.
298,663. Process of and Apparatus for Extracting Gold and Silver from their Ores. Charles P. Bonnett, Elizabeth, N. J.
298,718. Forge. James F. Winchell, Springfield, Ohio.

GRANTED MAY 20TH

298,727. Compound to Prevent the Fusion of Cinder. Wesley Case, Topeka, Kan., Assignor to the Coal Economizing Company, same place.
298,734. Apparatus for Reducing Sulphur. Ferdinand Dickert, Salt Lake City, Utah.
298,766. Coal-Drilling Machine. Lewis P. Moran, Handley, West Va.
298,771. Pump-Regulator. Eugene F. Osborne, St. Paul, Minn.
298,803. Oven for Drying Cores or Molds. Benjamin F. Watkins, Alliance, Ohio.
298,811. Flask of Molds. Hawley Adams, New York City.
298,859. Journal-Box. Conrad Kahler, Chicago, Ill.
298,866. Rotary Pump. George Lenhard, Detroit, Mich.
298,869. Stamp-Mill. George Shaw Long, Petrolia, Pa.
298,900. Machine for Grading and Purifying Middlings. Joseph Martin Shutz, Minneapolis, Minn.
298,912. Dumping-Car. Roy Stone, New York City.
298,938. Feeder for Mills, Purifiers, etc. William S. Bonnard and William H. Grupe, Terre Haute, Ind.
298,949. Machine for Making or Preparing Molds for Casting Metal. Jules Demogeot, Dunkirk, Assignor to the Société L. Denonvilliers et Fils, Paris, France.
298,952. Rotary Pump. Edwin Bryan Donkin, Bermondsey, England.
298,983. Process of Purifying Molten Iron and Steel. Horatio Keeler, Chicago, Ill.
299,030. Regenerative Skelp-Heating Furnace. Martin V. Smith, Tyrone, Pa.
299,049. Manufacture of Pig-Iron. John Francis Bennett, Pittsburg, Pa.

REISSUE.

10,481. Cupola-Furnace. William John Clapp, Nantyglo, and Thomas Griffiths, Blaenavon, County of Monmouth, England, Assignors to James Porter Witherow and Henry William Oliver, Jr., both of Pittsburg, Pa.

GRANTED, MAY 27TH.

299,098. Fan-Blower. Frederick C. Anderton, San Francisco, Cal., Assignor of one half to Samuel Dinsmore, same place.
299,103. Manufacture of Pig-Iron. John F. Bennett, Pittsburg, Pa.
299,109. Journal-Bearing. Charles F. Brigham, Worcester, Mass.
299,111. Process of and Apparatus for Forming Mineral Fiber or Wool from Furnace-Slag. Robert Burns, Chicago, Ill.
299,186. Water-Jacket for Rotary Pumps. Alexey W. Von Schmidt, San Francisco, Cal.
299,211. Dry Separator and Amalgamator. Herbert Earhart, Santa Maria, Assignor of two thirds to H. D. Livingston and Joseph Kaiser, both of San Francisco, Cal.
299,232. Base-Plate for the Teeth of Ore-Washer Shafts. George Lauder, Pittsburg, Pa.
299,235. Ore-Concentrator. John Lewis Loomis, Leadville, Colo.
299,259. Amalgamator. Edward Pike, Salt Lake City, Utah.
299,267. Compound Vacuum-Pump. Wilhelm Richter, Berlin, Germany, Assignor to the Internationaler Vacuum-Eismaschinen-Verein, same place.
299,290. Press for Holding and Cutting Sheet-Metal. Norman C. Stiles, Middletown, Conn.
299,293. Machine for Bending Nut-Locks. John B. Sutch, Pittsburg, Pa.
299,314. Air-Compressor. John F. Allen, Brooklyn, New York.
299,337. Apparatus for Washing Phosphate Rock, Ores, etc. Frederick Brotherhood, Charleston, S. C.
299,350. Rotary Engine. Ira Lucius Clough, Williamsport, Pa.
299,409. Amalgamating-Pan. George H. Malter, San Francisco, Cal.
299,429. Combined Drill and Countersink. Albert J. Smart, Greenfield, Mass., Assignor to the Wiley & Russell Manufacturing Company, of Massachusetts.
299,433. Machinery for Grinding or Sharpening Drills. W. Ford Smith and Arthur Coventry, Salford, Manchester, County of Lancaster, England.
299,447. Method of Locking Nuts to Bolts. Benjamin H. Williams, Lawrenceville, Pa.
299,448. Forge. James F. Winchell, Springfield, O.
299,478. Pump. Axel Jorgensen, Keystone, Minn.
299,487. Pump. James R. Maxwell, Cincinnati, Assignor to the Gordon & Maxwe Company, Hamilton, O.
299,496. Metal Boring and Slotting Machine. John Richards, San Francisco Ca

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, July 11.

There was a large business transacted in the mining market this week, and the prices of some stocks ruled higher than for some time past. Especially was this the case with the Comstocks, which seemed to boom in the early part of the week. They had a slight set-back at the close, but still ruled higher than the closing prices last week. Outside of the Comstocks and the low-priced shares, there was very little of interest. The Bodies seemed to be on the decline with the exception of Consolidated Pacific, which ruled strong and was actively dealt in. The Leadville stocks were almost neglected, and record no new features. The Tuscaroras were quiet and steady. Horn-Silver ruled strong under moderate transactions. A complete summary of the market is given below. The aggregate number of shares sold was 101,961, as against 82,618 last week

The Comstock shares were actively dealt in at stronger prices. California records an active business at strong prices; it sold from 25@52 @36c. Consolidated Virginia was very actively dealt in, and was quite strong at one time, but declined slightly toward the close; it sold from 21@50@34c. Sierra Nevada was quite strong, under a small business, selling from $1.40@$1.65. Union Consolidated sold also at strong prices, with a small business; it was quoted from $1.25@$1.85. Mexican sold at $1.35. Ophir sold at 90c., assessment unpaid, and from $1.40@$1.45 assessment paid. Consolidated Imperial was quiet and steady at 9@12c. Gould & Curry sold at strong prices, under a small business; it was quoted from $1.50@$2. Hale & Norcross was very strong, selling from $3.25@$4.75; it was but moderately dealt in. Best & Belcher sold at $2.50. Sutro Tunnel was very active, and sold at strong prices; it was quoted from 11@18@14c.

The Leadville stocks were almost neglected. Amie sold at 6c. Chrysolite was quiet and steady, selling at 90c. Iron Silver records but a small business at steady prices; it sold from 98c @$1@99c. Little Chief sold at 30c.

The Bodie stocks were moderately dealt in at weakening prices. Bodie Consolidated records a fair business at declining prices; it sold from $3.20@$2.50@ $2.75. Standard sold at $1. Bulwer sold on time sales, and dropped from 80@55c. Consolidated Pacific was fairly dealt in at strong prices, selling from 41@48c. Bechtel sold at 5c.

The Tuscarora stocks were very quiet, and sold at steady prices. Belle Isle was quiet and steady, selling from 55@57c. Navajo was also steady, selling from $4.10@$4, with a small business. North Belle Isle sold at 30c.

In the miscellaneous list, Eureka Consolidated sold at $2. Horn-Silver was moderately dealt in at strong prices; it sold from $5.13@$5.75. Robinson was very quiet, selling at 23c. Stormont sold from 10@ 13c., with a small business.

Barcelona was quiet and steady, selling from 18@ 16c. Caledonia was quite strong yesterday, selling from 57@75c., with a moderate business. Rappahannock records a fair business at steady prices, selling from 17@18c. Sonora Consolidated sold at 3c., and was very quiet.

The trustees of the Iron Silver Mining Company have called a meeting of the shareholders for the 28th inst., to consider the consolidation of interests now involved in litigation. The owners of the Nisi Prius extension, Leadville lode mining claims, and the Pease placer claim, have contested the right of the Iron Silver Mining Company to 65 acres of the 80 acres embraced in the Wells and Meyer placer claim, on which $40,000 have been expended. It is proposed that a new company be formed under the laws of Colorado, controlled by a board of seven directors, consisting of Governor J. B. Grant, C. G. Hall, G. E. Pease, F. G. White, W. Arens, P. Henderson, and H. A. Hoit. The proposed company is to have a capital stock of $500,000, divided into 50,000 $10 shares. The stock is to be subject to an assessment of $25,000 for working capital, or such smaller sum as shall be required for the proper development of these mining claims, each of the respective parties to have one half of the stock, and each to furnish one half of said $25,000, or a smaller sum.

At the meeting of the stockholders of the Iron Silver Mining Company, held in this city on March 5th, 1884, Messrs. E. W. Cottrell and Homer A. Hoit were appointed a committee to examine the books, accounts, and financial management of the company. Their report, quite a lengthy document, has just been issued. They review the management from its organization. The total output has been 266,777 tons of ore, dry weight, which yielded 4,878,370 ounces of silver and 76,450 tons of lead, worth together $5,062,540.01. Out of this, $1,300,000 has been paid in dividends, $111,682.04 was on hand on March 1st, 1884, and the remaining $3,626,000 was paid for labor, supplies, machinery, and permanent improvements.

In addition to this, the smelting and refining charges, transportation of ore, and commissions amounted to about $6,000,000, making a total of about $11,000,000, of which $7,000,000 has been expended principally for labor, or material that was the result of labor. The product and cost of the ore for the period of January 1st to May 1st, in the years 1884 and 1883, was as follows:

Receipts.	1884.	1883.
Company ore (in 1884, 11,379 tons @$15.07)	$171,520.79	
Company ore (in 1883, 26,927 tons @ $18.07)		$486,759.97
Tribute ore (in 1884, 3443 tons @ $20.93)	80,612.50	
Tribute ore (in 1883, 1765 tons @ $19.10)		10,230.40
Interest	225.55	
Total	$252,358.84	$496,990.37
Expenses.		
State account	$4,827.43	$4,984.50
Mining supplies	34,654.28	30,810.42
Timber account	22,604.61	31,694 53
New York office	1,766.70	2,775.74
Permanent improvements	7,653.32	13,667.14
Mining labor	124,694.10	170,182.64
Office and general expense	9,786.40	6,659.65
Taxes	2,070.00	1,578.75
Hauling ore	7,813.38	19,814.53
New machinery	6,415.12	12 144 26
New mining property	720.50	5,638.99
Legal expenses	15,088.83	20,574.04
Insurance	338.75	
Total	$238,442.42	$320,525.19
To tributers	55,661.75	23,488.51
	$294,104.17	$344,013.70
Loss	$41,745.33	
Profit		$152,976.67

The loss in the first four months of 1884 was $19,237.47 in January, $10,151.42 in February, $10,113.06 in March, and $2243.38 in April. The company had on hand on May 1st $108,682.04 cash, and $3000 bills receivable. The committee sees in this state of affairs "the most positive evidence of the necessity of the policy of the present management in undertaking to bring about a more economical condition of affairs than prevailed during the first period of production and prices." They state that "they find the office and financial business of the company under very efficient management, the system of keeping accounts satisfactory, and the results correct."

MEETINGS.

The following companies will hold their annual meetings for the election of trustees and the transaction of other business, at the times mentioned:

Holyoke Mining Company, Room 810, No. 18 Broadway, New York City, July 29th, from twelve to two o'clock P.M.

Iron Silver Mining Company, Mills Building, No. 23 Broad street, New York City, July 28th, at twelve o'clock M. Special meeting for the purpose of conveying a portion of the property to a new company.

Singleton Gold Mining Company, No. 374 Broadway, New York City, July 15th, at eleven o'clock A.M. Special meeting for the purpose of taking such action as may be necessary to relieve the company of its present pressing indebtedness.

DIVIDENDS.

The following companies have declared dividends payable in July:

Derbec Blue Gravel Mining Company of California has declared a dividend (No. 4) of ten cents a share, payable at San Francisco, on and after June 23d.

Hecla Consolidated Mining Company, of Montana, has declared a dividend of one per cent, or $15,000, and an extra dividend of the same amount, payable July 1st. Total dividends for the year, $120,000.

Little Schuylkill Navigation Railroad and Coal Company announces a dividend of three and a half per cent, payable July 12th.

Sierra Grande Mining Company, of New Mexico, has declared dividend No. 8 of fifteen cents a share, or $60,000, payable at Philadelphia, July 15th.

Virginia Manganese Company, of Virginia, has declared a dividend of ten per cent.

PIPE LINE CERTIFICATES.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
July 7	$0.62	$0.62⅜	$0.59¾	$0.59¾	7,896,000
8	.59½	.59⅞	.58¼	.59⅞	9,570,000
9	.6	.61¼	.59⅛	.60⅝	8.063.000
10	.60½	.61⅜	.59⅞	.60	6,771,000
11	.59¾	.61⅜	.59½	.61⅛	6,873,000
Total sales					39.173,000

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. July 4.	July 5.	July 7.	July 8.	July 9	July 10.
Albion						
Alpha						
Alta			2⅛	1⅞	2	2⅛
Argenta						
Bechtel						
Belcher			.80	.85		1⅛
Belle Isle						
Best & Belcher			2⅜	2⅛	2¼	2⅛
Bodie			2⅛	2½	2⅛	
Bullion						
Bulwer						
California			.30	.30	.30	.35
Chollar			2½	2⅜	3¼	3¼
Con. Pacific			.40	.40		.40
Con. Virginia			.30	.30	.30	.30
Crown Point			1¼	1¼	1⅜	1½
Day						
Elko Cons						
Eureka Cons						
Exchequer						
Gould & Curry			1¾	1½	1¾	1¾
Grand Prize						
Hale & Norcross			3⅜	3½	4⅜	4¼
Independence						
Martin White						
Mexican			1	.75	1	1¼
Mono						
Mount Diablo			2			2
Navajo			4¼	4⅛	4⅛	4
Northern Belle						
North Belle Isle						
Ophir			1⅛	.95	1⅛	1⅜
Overman						
Potosi			1⅛	1⅛	1¾	1⅞
Savage			1	.95	1⅛	1¼
Scorpion						
Sierra Nevada			1⅜	1¼	1⅜	1⅝
Silver King						
Tip Top						
Union Cons			.95	.85	.95	1¼
Utah			.60	.50	.60	.90
Wales Cons						
Yellow Jacket			2	2	2½	2¼

Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, July 10.

The market for copper stocks the past two weeks has not been marked by any special feature. The dealings, as for some time past, have been principally in Calumet & Hecla, which has ruled quite steady at the decline noted on the 26th ult. All the sales for the week ended July 3d were at $144; but on the 7th, after two holidays, an order to buy quite a large lot caused an advance to $147; but this did not hold, and the price again receded to $144, with a subsequent rise to $145, at which price about 150 shares were taken, closing to day at $144 bid, $145 asked. We have heard no rumors this week in regard to the next dividend, but it is generally conceded that a small one will be paid. The product for the month of June was 2096 tons, a falling off from May of 169 tons, but a gain over last year of 213 tons. The dealings in Quincy have been very light, not over 50 shares in the past two weeks, with a decline of 50c. to $35¼ last week, and a subsequent rise on small lots to $36, at which price it is now offered, $35½ bid. The June product was 281 tons, against 275 last year. A letter from the mine, July 1st, says they have hoisted over 20 tons of mass copper from the 26th level south, and there is more of it there. Franklin sold at $7, same as last quotation. Advices from the mine report June product 175 tons, about the same as last year. The mine seems to be showing fairly well. A sale of 25 shares of Atlantic is reported at $7½, same as last sale, May 14th. This mine produced in June 186½ tons, against 158¼ tons last year. There were no transactions in Huron, but $1¼ is bid for it, assessment $1 paid. The mine continues to look well, and is steadily increasing its product. The total production for the six months past was 467 tons, against 89 tons for the same period last year, an increase of 378 tons. The rest of the list is neglected.

In silver stocks, there is hardly the shadow of a market. A sale of 450 shares of Harshaw at 40c. and 200 shares Catalpa at 25c. comprise all the sales at the regular Board for the past two weeks. At

the Boston Mining Exchange, there is a dearth of business, and orders are very limited. The effort to bull Bowman Silver proved a failure, and the parties who engineered the boom and paid 20@21c. for it can not find any body to take it off their hands even at 12c. Dunkin is quite in demand with sales at 20c. Empire, dull, and offered at 15c.

3 P.M.—At the afternoon Board, Calumet & Hecla sold at $145. Franklin at $7@$6¾. Closing prices: Atlantic, $7 bid, none offered. Calumet & Hecla, $144 bid, $145 asked. Franklin, $6½ bid, $6¾ asked. Huron, $⅛ bid, none offered. Osceola, $11 bid, none offered. Quincy, $35 bid, none offered.

BULLION MARKET.

NEW YORK, Friday Evening, July 11.

DATE.	London. Pence.	N. Y Cents.	DATE.	London. Pence.	N. Y. Cents.
July 5	50⅜	110½	July 9	50¾	110¼
7	50 13-16	110½	10	50¾	110⅜
8	50 13-16	110½	11	50¾	110½

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of June.	Year from Jan. 1st, 1884.
		$	$
*Alice, G. S.	Mont.	†	520,843
*Belmont	Mont.		8,081
Bodie, G.	Cal.		301,857
*Bonanza King, S.	Cal.		190,891
*Boston & Montana, G.	Mont.		207,474
*Chrysolite, S. L.	Colo.	14,572	85,365
*Consolidated Bobtail, G.	Colo.		39,654
*Contention, S. G.	Ariz.		293,607
*Deadwood-Terra, G.	Dak.		209,974
*Derbec Blue Gravel, G. S.	Colo.		58,644
*Father de Smet, G.	Dak.	17,586	200,791
Grand Prize, S.	Nev.		25,000
*Hecla Cons., G. S. L. C.	Mont.	‡	320,052
Helena, S. L.	Mont.		164,000
*Homestake, G.	Dak.		509,357
*Hope, S.	Mont.		17,980
Horn-Silver, S. L.	Utah.		969,087
*Iron Silver, S. L.	Colo.		315,650
*Kentuck, G. S.	Nev.		16,847
*Lexington, G. S.	Mont.	98,594	612,686
*Little Pittsburg, S.	Colo.	6,983	52,949
*Moulton, G. S.	Mont.		317,899
*Mount Diablo, S.	Nev.		24,820
*Navajo, G. S.	Nev.		156,156
*Ontario, S. L.	Utah.		815,398
*Original, S. C.	Mont.		29,724
*Oxford, G.	N. S.	2,375	19,907
*Paradise Valley, S. G.	Nev.		45,164
*Plymouth Consolidated, G.	Cal.		455,526
*Rooks, G.	Vt.		16,068
*South Yuba, G.	Cal.		15,615
*Syndicate, G. S.	Cal.	14,714	76,408
*Tombstone, S. L.	Ariz.		392,692
United Gregory, G.	Colo.		7,174
Total amount of shipments to date			$7,339,658

* Official. † Assay value. ‡ Not including value of lead and copper. G. Gold; S. Silver; L. Lead; C. Copper. —— No bullion produced.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 2 per cent. During the week, the bank lost £374,000 bullion, but the proportion of its reserve to its liabilities was raised from 42½ to 43, against 42 5-16 per cent at this date last year. The weekly statement of the Bank of France shows losses of 5,032,000 francs gold and 4,073,000 francs silver. The statement of the Imperial Bank of Germany shows a decrease in specie of 8,563,000 marks.

METALS.

NEW YORK, Friday Evening, July 11.

Copper.—It is rumored that Lake copper is selling in a quiet way abroad, though no figures are mentioned. Should this prove to be the case, it would show that the companies have determined not to let an excess burden this market. In Arizona, the Southern Pacific is again open to traffic, which puts the Globe and other districts in a position to obtain their fuel supplies. The Longfellow, which is reported to be looking better, has begun smelting with two furnaces. We quote Lake copper 14@14⅛c., and other brands 13@13⅛c. London cables £53 17s. 6d. for Chili Bars and £60 10s. for Best Selected.

Tin.—The market has been stiffening, and 18⅞@19c. is now quoted for Straits tin, cash, large lines. London cables £82 12s. 6d.

Lead.—The market has been without any vim and has shown a declining tendency. During the past few days, about 300 tons have been placed at 3·60c., 3·57½c., and 3·55c., at the close the latter figure being the quotation.

Messrs. John Wahl & Co., of St. Louis, telegraph us as follows to-day: Our market remains about the same as last week, if any thing a shade weaker. Sales for the week sum up 200 tons of Common lead at 3·40c. and 100 tons of Soft lead at the same figures.

Messrs. Everett & Post, of Chicago, wire us as follows to-day: Our market is very flat and weak at 3·40c. We hear reports of a car-load offering at 3·37½@3·35c. However, the quantity offering is not large, and is confined to a few refiners.

Spelter.—The market remains dull at 4·55c. for Common Domestic. London cables £14 7s. 6d. for Silesian.

Antimony.—There is no change to note.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, July 11.

American Pig.—The only feature of interest is a decline of 50 cents in the quotations of No. 2 X Foundry. About 1000 tons have been placed during the week by the Thomas Iron Company at $19. We learn also of the sale recently at a New Jersey furnace of 4000 tons of Gray Forge at $16 at furnace. No. 1 Foundry remains firm at old quotations.

We quote standard brands: No. 1 Foundry, $20@$20.50; No. 2, $18.50@$19; and Gray Forge, $17.50@$18.50, with outside brands from 50c.@$1 lower. Spiegeleisen is nominally $28 for 20 per cent.

Scotch Pig.—It seems difficult to move even small quantities, and considerable pig is going into stock.

We quote ex ship and to arrive: Coltness, $21.50; Langloan, $21.50; Summerlee, $21; Dalmellington, $20; Gartsherrie, $21.25; Eglinton, $19.50@$20; and Glengarnock, $20.50.

At the Metal Exchange, the following cable quotations have been received: Coltness, 57s.; Langloan, 53s. 6d.; Summerlee, 50s. 6d.; Gartsherrie, 51s. 9d.; Glengarnock, at Ardrossan, 49s. 6d.; Dalmellington, 47s.; and Eglinton, 44s. Warrants, 41s. 3d.

Steel Rails.—Business during the week has been limited to small lots at $30 at mill. Reports of lower figures are not founded on fact. Light sections command from $33@$36 at mill.

Old Material.—Nothing of any consequence has been done. We quote Old Rails $18.50@$19.

Philadelphia. July 11.

[From our Special Correspondent.]

Pig-Iron.—Brokers report very little inquiry for pig-iron, and nothing selling except in small lots. Prices have not changed, ranging from $19@$20.50 for No. 1, $18@$19 for No. 2 Foundry, and $15.50@$18 for the various grades of Gray Forge. The demand for the latter is very light, as the bar mills are shut down. Every thing is unusually quiet, and will probably remain so—at least, for a week or two to come.

Foreign Irons.—Bessemer is reported as very quiet. Quotations are unchanged at $19@$19.50. Spiegeleisen, nominally $28 for 20 per cent. No sales.

Muck-Bars.—Quotations are given at $30.50@$31.50.

Merchant Iron.—The demand for small lots is fair, and it is believed that trade will improve from this out. Prices for Refined Bars range from 1·80@1·95c. The stores are doing very little; most of the mills will be in operation by the 15th.

Nails.—Stocks of nails are reported light and demand moderate. The usual price paid is $2.40, with some sales reported at less. Most of the mills are making some restrictions, but will all be at work again in a short time. The building demand is less active.

Plate and Tank-Iron.—Orders are coming in more freely, and the aggregate of business for the past week is encouraging. One or two mills report themselves well supplied with work for at least two months to come, with fair prospects of continued activity. Prices are a little firmer, though no higher.

Structural Iron.—The long talked of contract for supplies for the construction of the Brooklyn Elevated Road has at length been placed with the New Jersey Steel and Iron Company, at Trenton. It consists, in all, of 10,000 tons, of which 4900 are angles, from 2000 to 3000 tons of plate, and the remainder pillars, posts, etc. The prices were unusually low. This contract was offered to the Phœnix Iron Company, but declined, as the terms of payment were not satisfactory. There is inquiry in the market for several lots of structural iron, and the mills are likely to be kept busy.

Steel Rails.—There have been several small sales of steel rails at $30@$31.50, according to size of order. Most of the companies are willing to accept $30 cash. A good many would-be buyers are offering bonds and long time, which is not at all satisfactory to the rail makers. The Bethlehem mill is closed for the time being. It is probable that, should prices decline further, some of the mills now in operation will shut down, as it is believed that cost of production is down as low as it can go for the present, and $30 allows a very narrow margin of profit. There has been some demand for light sections, which have sold at $36@$37.

Old Rails.—Car-load lots have sold at $19. It is reported that there are sellers at $18; but, if so, they can easily find buyers ready to do business. There is some inquiry to-day for 100-ton lots.

Scrap-Iron.—There is very little inquiry and scarcely any business to report. Prices are still weaker, and No. 1 Wrought can be bought at $20@$20.50.

Pittsburg. July 10.

[From our Special Correspondent.]

Pig-Iron.—With the exception of a slightly improved demand, trade this week maintains that dull and lifeless appearance characteristic of it for the past week or two, and prices generally are unchanged. It is thought, however, that the worst of the dullness is over, and the belief is current that the fall trade will make up for the dullness of the present season. The fact that a good many mills will not do much at making iron for a few weeks longer during the hot weather will keep the demand for pig dull for that length of time. Mill-owners do not care to anticipate future wants; but as improvements in the past have often taken place when least expected, the same may occur this year. Notwithstanding, the situation at present is any thing but encouraging. The number of idle furnaces is increasing and production consequently reduced. The sales reported last week were 1600 tons. Quotations are as follows: Neutral Mill, $16@$16.50; All-Ore Mill, $18; Foundry, Native Ore, $18@$19; Foundry, Lake Ore, $19; Foundry, Charcoal, $22.50@$25; Car-Wheel, Charcoal, C. B., $25@$27.50; Bessemer, $19 50@$20.

Manufactured Iron.—There are no new features reported. The demand continues unusually light. Prices low. Bars, 1·80@1·85c.; No. 24 sheet, 3c.; Plate, 2·35c. All 60 days, or 2 per cent off for cash.

Nails.—The demand continues light in sympathy with every thing else in the manufacturing world. Prices are: 10 days to 60 days, $2 20, 60 days, or 2 per cent off for cash, with 10 cents abatement on car-load lots.

Muck-Bar.—The dullness continues in this line, and quotations are made at the last-mentioned prices, $29.50 to $30 cash.

Wrought-Iron Pipe.—There is fair business in this line, the mills turning out much natural-gas tubing, but in other lines trade is slow. Prices remain unchanged.

Steel Rails.—There are no sales reported, and production is limited. Prices are $32, but we hear of no sales at the local mills.

Steel.—Trade continues dull, and prices, especially for Bessemer and open-hearth steel, are lower than ever before, with but few, if any, of the mills working any thing like full-time.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, July 11.

Anthracite.

The situation in the anthracite coal trade is one that it is difficult to define, and conflicting reports are emphatically put forward by different parties to suit their temporary interests. We have, during the past six months, been violently accused, over and over again, of showing a decided leaning to the bear side, of hurting the trade and the great interests involved by constantly and persistently taking a gloomy view of its condition and its immediate future. In the early part of the year, when we were first to insist upon the effect upon the trade of

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	July 5.		July 7.		July 8.		July 9.		July 10.		July 11.		SALES.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.													
Amie Con., Co.							.06		.06				1,000
Argenta													
Bassick, Co.													
Belle Isle, Ne.													
Bodie Cons., Ca.			3.20	3.00	.55						.57		300
Breece, Co.					2.80	2.60			2.95	2.50	2.75	2 60	1,650
Bulwer, Ca.													
California, Ne.			.30	.25	.52	.28	.80		.55		.55		200
Cal. & Hecla, Mich.							.40		.40	.30	.38	.36	7,900
Castle Creek													
Chollar													
Chrysolite, Co.					2.60								100
Cons. Va., Ne.			.30	.21	.90	.32	.41	.37	.40	.32	.36	.32	1,600
Deadwood-Terra, Dk.					.50								16,110
Dunkin, Co.													
Eureka Cons., Ne.													
Father de Smet, Dk.			2.00										25
Findley, Ga.													
Gold Stripe, Ca.													
Gould & Curry, Ne.					1.90						2.00	1.50	400
Grand Prize, Ne.													
Green Mountain, Ca.													
Hale & Norcross, Ne.					3.25						4.75		200
Hall-Anderson, N. S.													
Homestake, Dk.							9.50						10
Horn-Silver, Ut.					5.25	5.13	5.50	5.38	5.50		5.75		1,656
Independence, Ne.													
Iron Silver, Co.					.98		1.00				.99		300
Leadville C., Co.													
Little Chief, Co.					.30								1,100
Little Pittsburg, Co.													
Martin White, Ne.													
Navajo, Ne.			4.00		4.00		4.10		4.05		4.00		1,100
Northern Belle													
North Belle Isle, Ne.					.30								100
Ontario, Ut.											20.00		105
Ophir, Ne.			.90		1.45	1.40							580
Quicksilver Pref., Ca.													
" Com., Ca.													
Robinson Cons., Co.											.23		300
Savage, Ne.													
Sierra Nevada, Ne.					1.55	1.50	1.55	1.50	1.40		1.65		800
Silver King, Ar.													
Spring Valley, Ca.													
Standard, Ca.											1.00		100
Stormont, Ut.									.10		.13		1,000
Tip Top, Ar.													
Vizina, Ar.													
Yellow Jacket													

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	July 5.		July 7.		July 8.		July 9.		July 10.		July 11.		SALES.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Albion													
American Flag													
Barcelona, G.					.18						.16		2,500
Bechtel Con., G.									.05				100
Belvidere													
Best & B'licher, G. S.					2.50								450
Big Pittsburg, S. L.													
Bradshaw, S.													
Bull-Domingo, S. L.													
Cal., B. H., G.									.75	.57			500
Central Ariz'na, S.													
Climax, Co.													
Colorado Central.													
Cons. Imperial.							.09		.12				2,300
Con. Pacific			43	.41	.44	.42	.47	.45	.47	.46	.48	.47	6,700
Decatur													
Durango, G.													
Eastern Oregon													
Goodshaw, G.													
Harlem M. & M. Co.													
Hortense, S.													
Lacrosse, G.													
Mariposa Pref., G.													
" Com., G.													
Mexican, G. S.					1.35								400
Mono													
North Standard, G.													
N. Horn-Silv'r, S. L.													
Ori'nt'l & Miller, S.					.11								1,300
Rappahannock, G.					.18		.17		.18		.18		5,300
Red Elephant, S.													
Ruby, of Arizona.													
Silver Cliff, S.													
Sonora Con.							.03				.03		5,000
South Bodie, G.													
South Bulwer, G.													
South Hite													
South Pacific													
State Line, 1 & 4, S.													
" Nos. 2 & 3, S.													
Sutro Tunnel			.11		.16	.12	.18	.14	.17	.14	.16	.14	40,300
Taylor Plumas													
Unadilla, S.													
Union Cons., G. S.			1.25		1.60		1.50		1.70	1.50	1.85		475

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 36,636. Non-dividend shares sold, 65,325.

low prices of bituminous coal, our predictions were scoffed at. To-day, no one will deny that they were moderate and were within the truth. From month to month, we insisted upon a continuance of a restriction of output. In spite of assertions and arguments to the contrary, the companies were, month after month, forced to acknowledge its necessity. We have been guided by the principle that the province of a newspaper was to speak the truth, however unpalatable it might be. If the ENGINEERING AND MINING JOURNAL were a trade paper of the low standard that is becoming only too common, we should now say, on the all-engrossing topic of the day, that the coal combination is unassailable, that the rumors of the past week emanate only from the fertile brains of a lot of stock-jobbers, and more to that effect. As the simple recorder of current events, we are forced to acknowledge that they are the outgrowth of a feeling that is growing steadily. We have shown, recently, what are the causes of that dissatisfaction, and have indicated what to us seemed to be the best remedy. Much is to be said on this subject that is still suppressed from motives of policy, and we shall in the near future dwell upon some of the points involved. Suffice it to say now, that the sentiment that has come forward so prominently this week is the outgrowth of a growing conviction that a readjustment must take place sooner or later. But while the situation may be termed critical, and while there is a good deal of friction, the relations between the members of the combination are by no means strained to the point that many would like the public to believe. It is likely that a suspension of mining will be agreed to for August, although not without bad grace on the part of some companies. Pushing aside all that is sensational, it may at once be conceded that there is some fire where there is so much smoke. There is discontent with the present unjust, extremely wasteful and dangerous method of restriction; but there is, we feel sure, a general and profound conviction that a departure from the policy of a reduction of the supply within the limits of the demand would be suicidal.

Bituminous.

There are no new features. The trade is extremely dull and unsatisfactory, so far as prices are concerned, though the volume has undoubtedly grown largely. A striking fact is, that the quality of the different coals is more closely scrutinized, and that therefore less well-known kinds must be content with comparatively low figures. A good deal of such coal is selling at $3 per ton, while for the best kinds of George's Creek Cumberland as much as $3.70@$3.75 is obtained.

Philadelphia. July 11.

[From our Special Correspondent.]

Broken and egg coal is scarce. Stocks at Port Richmond are 23,000 tons to-day, and, with the restriction of the coming week, it is probable that the scarcity will enable prices to be maintained at the rates agreed upon July 1st. Mr. Eugene Borda is to-day loading over 5000 tons, and says that by the first of August the wharves will be practically bare. Freights are still low, and vessels in good supply. As to the rumor of the withdrawal of one of the leading companies from the anthracite combination, it may be set down as without foundation, so far as responsible parties here have information. The existence of the combination is not threatened, nor has any agreement been entered into, nor has there been any conference held to decide the policy of the combination next month. There are, of course, a great many opinions expressed, and there are not a few here who would be glad to see the solid coal combination strike a rock somewhere and go to the bottom. The amount of coal shipped over the Reading last week was 26,012 to s, against 95,000 tons for the same week last year. The total production to date is 5,932,000 tons, against 5,092,000 tons up to the same time last year, showing an increase for this year of 840,000 tons. The Schuylkill Canal shows a decrease of 27,000 tons this year. The talk on the street shows more or less discontent at the existing trade conditions. The best informed believe that there will be no need of any further restriction, and that the usual policy as to prices during the last half of the year will be maintained, and that demand will show itself, as it ought to, without any more sulking. A good deal of coal is wanted in New England, and four or five of our larger dealers are endeavoring to bring negotiations to a close. Next week will likely close some heavy contracts.

Our local demand is looming up, and some yards have booked contracts enough to keep them busy for the rest of the month, and will increase their hauling capacity in a few days. A number of manufacturers have given their orders. Domestic demand is improving, and good stove is in short supply: the straw fire over discrimination is about burned out. The line trade is improving, and some of the large consumers will place their orders this month, and all of them within perhaps thirty days, to the extent of their storage capacity. Some little revival is talked of in industrial quarters. The iron mills will all start up after the middle of the month, and coal men look for a favorable demand from all quarters.

Manufacturers all over the country are taking a rest of two or three weeks, and this has lessened the demand for bituminous. One of our operators pleads guilty to not having sold any thing since the 4th. His remarks as to trade prospects are not entertaining. Still, the Clearfield region is booming along, according to figures, which are 49,718 tons for the week ended July 5th. The Cumberland production for last week was 53,500 tons, of which 33,095 tons were brought over the Cumberland & Philadelphia Railroad.

Pittsburg. July 10.

[From our Special Correspondent.]

The coal trade hereabouts is absolutely without change. The river miners are still idle through a strike, and the railroad miners largely idle on account of the prevailing dullness. This tells the story, but it is given more in detail below.

One thing that indicates well the natural-gas fever is the number of new derricks, still new enough to be white, unsoiled by Pittsburg soot, that are noticed in different parts of the city. Coming in on the Pittsburg Railroad, one is seen near the Black Diamond Steel-Works, another near the French Spring-Works, and at the east end the valley is dotting with the peaked heads. There are others going up at Manchester, at Wood's Run, along the South Side, and, in fact, everywhere that by any sort of reasoning can be considered on the gas belt. The drillers are hard at work, and quite a number find employment in this city who were thrown out of work by the restriction of production in the oil regions. Washington County, the Hess and other large wells are going down near the McGuigan and another big flowing well. The gas has been tried under the boilers at the Jefferson iron-works, Steubenville, and has proved a lasting success. But to return to coal. The gas may already be said to have put the railroad trade considerably at odds and ends. For slack and nut, it has caused most of the operators along the different roads, except the Pan-Handle, to hunt new markets. Consequently they are cutting rates, and have

succeeded in completely demoralizing the trade, so that there is very little doing. Much of the stuff is stocking up, and what is sold is almost given away. The lump trade is not seriously affected yet, but its time is coming. When the glass-houses start up, a number of them will be using gas. Along the railroads, the pits are still working but from one to three days a week, but work is expected to become more regular within a few weeks. There will probably be some work coming here from the Hocking Valley, where, it is reported, the Coal Exchange proposes to import foreign labor to take the places of the strikers. Coal is selling here around 5½ cents a bushel on the wall. There should be some orders coming in now, but I hear of none of consequence.

The river miners keep a stiff upper lip and out of the pits at the same time. This is a good season for vegetables and labor demonstrations, and then it is almost too hot to work. These reasons probably go as far as any other in explaining the continuance of the strike. The operators have succeeded in bringing up a number of good fleets of empties, which are now in the pools ready to be filled, so that if the men care to return to work, they will have enough to keep them busy for some time. In the first and fourth pools, a number of pits are at work and are filling the barges of other operators whose men are idle. All the efforts of the miners' officials to get them on strike have thus far proved futile. There are no indications discernible now that appear favorable to a compromise of the trouble. A few weeks longer, with things as they are now, must settle the trouble one way or the other. There is no local trade, and down the river, where stocks are fair, coal is still selling at 7@7½ cents a bushel. Trade continues dull at both Cincinnati and Louisville, while at New Orleans it has grown worse, if such a thing was possible.

The coke trade is without new features. The ovens are working again, as before the Fourth of July week, when they were cold for three days. There is a slight improvement in tonnage over a week ago. Prices remain as heretofore quoted.

Buffalo. July 10.

[From our Special Correspondent.]

The stocks of anthracite coal here for shipment have been reduced to a very great extent. Small dealers do not, as in days gone by, lay in their supplies in local yards during the cheap season, but make an arrangement with the large companies and draw as wanted from them. Therefore the quantity in retailers' hands is practically *nil*. Dealers take the situation very coolly; buyers do the same; and the result is a very light movement for domestic purposes. The former say that the latter must have coal sooner or later, and if later, "then the customer will have to pay for his procrastination." The latter expects that the time is coming when he will have to pay less than the present current rates, as there will be an end to the compact before long. The future will enlighten us as to which side will wear the victor's laurels.

Messrs. S. S. Jewett & Co.'s stove-works have shut down, throwing 800 men out of employment. It is to be hoped that the stoppage will be of short duration, but business generally is very dull, and there is a large surplus of all kinds of manufactures on hand here and elsewhere. Many small establishments here are running only on short time. This also means less coal.

It is estimated that this city requires 280,000 tons of anthracite coal for the year's consumption; probably not more than 60,000 tons have been purchased thus far: this leaves a large quantity still to be sold. At the advanced rates, the losses made early in the season by "cutting on the sly" can easily be made up. If the bottom should give out later, things would not be so pleasant, hence the effort to keep the compact intact by the offer of extra inducements to the small dealers, as mentioned in my last.

Coal at the end of last week was very scarce, and vessels already chartered were hindered to an annoying extent from loading. Since then, coal has arrived more freely, and there will probably be enough to finish the required tonnage. Freights are steady. The following are the rates at which charters were made: To Chicago, Milwaukee, and Sheboygan, 80c.; to Kenosha and Racine, 90c.; to Marquette and Duluth, 75c.; to Ontonagon, $1; to Port Arthur, $1.05; to Sandusky, 30c.; to Detroit, 25c.; to East Saginaw, 35c.; to Superior City, about 75c. Closing weak and nominally unchanged; with coal again reported very scarce.

Shipments by lake from July 2d to 9th, both days inclusive, 50,990 tons, namely, 32,900 tons to Chicago; 6620 tons to Milwaukee; 1950 tons to Duluth; 2500 tons to Port Arthur; 670 tons to East Saginaw; 550 tons to Sheboygan; 1290 tons to Detroit; 2680 tons to Marquette; 1030 tons to Superior City; and 800 tons to Ontonagon.

Receipt of coal by canal for the week ended 7th instant: 4154 tons, and shipments 908 tons.

Receipts by lake for the week ended 7th, only 180 tons.

Receipts by Lake Shore & Michigan Southern Railroad for the week ended the 7th instant, 936 tons; 660 tons for Buffalo, and 276 tons for other points.

The charters of coal by canal were 1 boat-load to Albany, 95c. net ton; 1 boat-load to Knowlesville, 50c. net ton; and 2 boat-loads of coal-dust to Syracuse, 65c. gross ton. Captain to pay unloading in all cases. The nominal rate to New York for coal, was $1.30 per net ton, captain to pay unloading.

The schooner Wells Burt, with a cargo of 1500 tons of coal, was wrecked on Lake Michigan last year. Her cargo is going to Chicago, and the whole is expected to be recovered. Pumping coal from a wreck, especially at the depth at which the Burt lies, 40 feet, is a new thing on the lakes, and it has never been accomplished before, although attempted repeatedly. Large pieces of coal, some weighing 15 pounds, reach the deck through the medium of the pump.

The steam barge Onoko left yesterday afternoon for Chicago with 2800 tons of coal. She was delayed in port one week, in consequence of the scarcity of that commodity. Yet with the large demand from the West, present and prospective, the news comes that further suspension of mining is recommended.

An advance on coal freights has been made by the Rochester & Pittsburg, the New York, Lake Erie & Western, and the Buffalo, New York & Philadelphia railroads. The Rochester *Express* says: "It is made on the basis first offered on the pooling of the tonnage, one third each, and advancing of carrying rates to $1.40 a ton. This, of course, ends all legal disputes that have arisen between the companies, and is of prospective benefit. Seven eighths of the coal tonnage of the year is already under contract, but future contracts will be at the new figures. Last month, the tonnage of the Rochester & Pittsburg was 55,000 tons, and, had the new price prevailed during that time, the gross earnings of the road would have been increased $10,000 or $15,000. The other roads would have had a corresponding increase. The agreement is in no way restrictive, and each company will get all the new business it can. The New York, Lake Erie & Western and the Buffalo, New York & Philadelphia had a monopoly of the bituminous coal trade when the Rochester & Pittsburg went into the field. Possessing the advantages of a shorter haul, it was a competitor commanding respect. The cutting of rates was suicidal to all concerned in it, and the restoration of reason and common sense will be hailed by the stockholders of the several roads with delight."

The retail prices of anthracite coal, screened and delivered within our city limits, per ton of 2000 pounds, are as follows: Grate, $5.15; Egg, $5.25; Stove and Chestnut, $5.45; No. 4 Stove, $5.70; and No. 2 Chestnut, $4.25.

The anthracite coal contract for the School Department was awarded to the lowest bidder, Mr. C. T. Hall. The rate was $4.69 per ton delivered, half stove and chestnut, and $4.47 for egg. These figures were 56c. less than the agreed price of the published schedule on stove and chestnut, and 43c. on grate. You can believe that "the thunder rolled and the lightning flashed" when the bids were opened and the prices made known. The sky is not thoroughly free from obscuration even now.

The quantity of coal shipped from Buffalo by lake, from opening of navigation to July 1st, reaches 410,762 tons, as reported by a firm which professes to be exact in figuring, divided thus: 204,045 tons to Chicago, 107,439 tons to Milwaukee, 38,272 tons to Duluth, 14,745 tons to Racine, 14,202 tons to Toledo, and 32,059 tons to sixteen ports not given in detail. My figures show 36,000 tons shipped in excess of this statement.

The City Directory for 1884 is just published. Estimating three and a half persons to every name, the population is 223,179. Adding the floating population, it is fair to estimate that 250,000 souls are within the city limits. A goodly growth.

Receipts at Duluth for the week ended the 5th July, 21,105 tons, and for the season, thus far 112,268 tons.

Chicago. July 9.

[From our Special Correspondent.

There is an entire absence of any new features to report concerning the condition of the anthracite market at this point. Chicago coal dealers, as well as all other Chicagoans, are so completely absorbed in the doings of the National Convention in session here that all business is more or less neglected. "The situation of the wholesale coal market is one of calm expectancy, so far as we shippers are concerned," said a big gun in the trade here to-day, by which masterly use of English I presume he meant to convey the impression that coal shippers feel pretty well satisfied with the situation, and are tolerably certain that matters are moving to their ultimate advantage. At any rate, this is the gist of the whole thing. Trade is not noticeably better than it has been for weeks past, orders from the country continuing of the hand-to-mouth order, the country retailer evincing almost as firm a determination to keep out of the market until there shall be a break, or at least an easier market for the purchaser, as the wholesaler shows in the opposite direction. The shippers are sticking bravely to their colors, and no sales are made except at full rates, nor are contracts made ahead at present circular prices. They feel sure that it will not be necessary to maintain the fight much longer; for the country trade, they think, must capitulate and begin to order in earnest. When the activity once begins, it will be lively work for the shippers and the railroads. Country yards are, as a rule, more nearly destitute of coal than at any previous time for years, and the probability of serious transportation difficulties over a scarcity of cars when the rush begins, is a question some are already considering. With a higher circular, a firm market, and a scarcity of cars for immediate shipment, the country dealer in September or October would be asking himself why he did not lay in his supplies in July. Lake receipts are a little heavier, there being somewhat more coal arriving at Buffalo for shipment than last week. Freights are firm at 90c. from Buffalo to Chicago.

Rail receipts are light and promise to continue so for some time. All bids received for the supplying of the city water-works with 15,000 tons of coal have been refused and new ones called for.

Bituminous coals are in ample supply and light demand, with a tendency to even greater weakness than has prevailed in this branch of the market for a long time past. Probably Indiana Block and Wilmington hold their own as well as any of the Western descriptions. Very little Hocking Valley is coming in, there being a strike in that region.

The coke market is dull and lifeless, there being no improvement in the demand, while receipts are liberal. There are no changes to note in our quotations of last week.

Boston. July 10.

[From our Special Correspondent.]

We have to note a small movement in anthracite coal at this port. The circular advance amounts to about 25 cents on Stove, 15 cents on Chestnut, and 10 cents on Pea, with no change in the steam sizes. There is hardly enough business stirring to base a report upon. We hear of no sales under the full advance asked, say, net f. o. b. prices of $4.25 at New York for Stove; $3.65 for Broken and Egg; $4.15@$4.20 for individual Stove; and $3.50 for Broken and Egg. These quotations are very little better than nominal, however, both at New York and Philadelphia, where, at the latter port, the f. o. b. net prices are quoted at $3.90 for Stove; $3.65 Chestnut; $2.50 Pea; $3.35@$3.50 Broken and Egg. Special coals at Philadelphia are firm at $4.85 for Broken, and $5.35 for Stove. The Philadelphia & Reading Company is in position to demand the full advance of 15 cents on Broken, 25 cents on Egg, and 10 cents on Chestnut, Lykens Valley, which continues short and is much wanted in this market. Considerable coal is coming forward on old orders.

Jobbers have advanced pocket prices to conform to the new circular as follows: Hard White-Ash Stove, $5.50; Egg and Broken, $5.10; Pea, $4; Nut, $5; Free White-Ash Stove, $5.50; Broken, $4.85; Egg, $4.90; Nut, $5; Lykens Valley Egg and Stove, $6.85. These quotations are for 100-ton lots.

A stray contract for 2000 tons bituminous has lately been taken by a Clearfield concern at about

$2.50 f. o. b. Further than this, we hear of nothing beyond the regular business on old contracts. It is said that what little coal the Vanderbilt interest is placing in this market, and in any market, in fact, is not obtained from its mines, but from a 100,000-ton lot which was bought of a prominent Clearfield operator some time since, so that by this means the Vanderbilt coal might get started in a small way this season. You have the rumor for what it is worth. It is said that the Pennsylvania road gave a freight rate on this coal on the representation that it should not go into competition with other bituminous coal. If the coal actually mined by the Vanderbilt people should not come up to the quality of the coal that they are now said to be selling, it might make some unpleasantness. However, it is generally believed that the new coal will form an important factor in the season of 1885. We quote cargo lots at $2.50@$2.60 f. o. b. at Philadelphia and Baltimore.

The freight market continues to show low prices, and we note a decline of 5 cents at Baltimore, finally. We quote:

New York, 90c.@$1.15 per ton; Philadelphia, $1.15@$1.25; Baltimore, $1.35; Newport News, $1.25; Richmond, $1.30; Bay of Fundy, $1.50@$1.60; Cape Breton, $1.80@$1.90.

There is a little more retail trade. Prices are trembling on the rise, like the drawbridge in Scott's story Marmion. The unfortunate probability is, that they will continue to tremble, owing to the prevalent dog-in-the-manger policy among leading dealers. The effort is to establish a fair advance of 25 cents. We quote old prices delivered:

White ash, furnace, and egg	$5.25@5.50
" " stove and nut	5.50@5.75
Red ash, egg	5.75@6.00
" " stove	6.00@ ....
Lorberry, egg and stove	6.50@ ....
Franklin, egg and stove	7.25@7.50
Lehigh, furnace, egg and stove	5.50@5.75
" nut	5.50@5.72

The six months' receipts of domestic coal at this port figure up 887,689 tons, against 928,575 tons for same period of 1883, showing a decrease of 40,886 tons. During the month of June, the receipts, as compared with June, 1883, increased 17,985 tons.

Ohio. July 9.

[From our Traveling Correspondent.]

The first half of 1884 has passed and left the record of an extremely dull six months for the coal trade of Ohio. Early in the season, those who had large orders to place were very reluctant, and finally, when these orders were placed, Pittsburg got the lion's share, and the settlement of difficulties in the Indiana Block District enabled Indiana operators to take a large part of the remainder, leaving Ohio and the Hocking Valley District especially only slim picking. This caused the operators of the latter district to determine on a reduction of 10 cents in the price of mining, which led to a strike in all the Hocking Valley mines, and an almost entire suspension of the Columbus, Hocking Valley & Toledo Railroad.

An attempt is making by the Miners' Union to induce all the miners in the State to go out on July 15th. I am not informed as to the probabilities; but it is difficult to see what reason could be given to induce the men in the Massillon and Mahoning districts, whose output has no bearing on either the supply or the demand for Hocking Valley, to engage in a strike and lie idle, thus losing needed earnings, while rendering no substantial help to their fellow-workmen in the Hocking Valley. With the large contracts already secured by rival operators, and the strike of the miners, the Hocking Valley operators are not likely to do much in the way of output this year—at least, not until after September 1st, or the close of navigation.

The Ohio Central people, not having reduced the price of mining, are still shipping some coal. The miners along the Cleveland, Lorain & Wheeling Railroad, in the vicinity of Massillon, are doing the usual amount, and some—notably Beaver Run—are doing all the capacity will admit. Along the lower end of the line, at Maynard and Wheeling Creek, it has been dull. The Mahoning Valley has been dull, generally speaking, because of the stagnant condition of the iron industries of the valley. The Pittsburg, Cleveland & Toledo has been bringing considerable coal to Cleveland for lake shipment, which has added to the freight traffic of the Valley Railroad. The mines along the latter, in the vicinity of Canton and Mineral Point, have been doing fairly, and the general business of the Valley shows a decided increase over last year. What the next six months will bring to the coal trade, is one of those things that no one can fathom. If confidence should be restored in any considerable degree, there must necessarily be quite a brisk business during the latter part of the year. The fact that many large dealers and manufacturers are beginning to say, "We don't care to push business at present figures," shows the bottom must have been reached, and, judging by the past, the American people will not stay long at the bottom. And when they start up, every one will strive to keep just a little ahead of the rest. A decline from $1 to 90 cents in lake freights on ore from Escanaba, and proportionately from other points, may make vessels more plenty, and weaken the heretofore stiff rates on coal for upper lake points.

STATISTICS OF COAL PRODUCTION.

Comparative Statement of the Production of Bituminous Coal for the week ended July 5th and year from January 1st:

Tons of 2000 pounds, unless otherwise designated.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Cumberland Region, Md.				
Tons of 2240 lbs	53,506	1,341,183	54,709	1,150,546
Barclay Region, Pa.				
Barclay RR., tons of 2240 lbs	4,602	166,979	4,830	163,486
Broad Top Region, Pa.				
Huntington & Broad Top RR., of 2240 lbs	.....	94,345	2,151	99,776
East Broad Top	.....	.....	.....	.....
Clearfield Region, Pa.				
Snow Shoe	2,278	94,346	2,768	123,985
Karthaus (Keating)	1,296	14,351	.....	.....
Tyrone & Clearfield	49,177	1,560,059	44,845	1,414,555
Alleghany Region, Pa				
Gallitzin & Mountain	6,336	194,022	5,002	228,774
Pittsburg Region, Pa.				
West Penn RR	4,464	146,814	2,395	226,822
Southwest Penn. RR.	1,057	76,781	1,532	56,134
Pennsylvania RR	4,541	144,779	9,877	260,972
Westmoreland Region, Pa.				
Pennsylvania RR	22,055	625,562	20,875	701,147
Monongahela Region, Pa.				
Pennsylvania RR	4,541	79,438	.....	.....
Total	153,853	4,538,659	148,984	4,426,197
Increase		112,462		

Comparative statement of the production of anthracite coal for the week ended July 5th, and year from January 1st:

Tons of 2240 lbs.	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Wyoming Region.				
D. & H. Canal Co	.....	1,644,648	21,800	1,790,355
D. L. & W. RR. Co.	46,036	2,257,716	45,228	2,264,252
Penna. Coal Co	6,315	556,821	13,771	637,692
L. V. RR. Co	.....	629,183	5,310	525,965
P. & N. Y. RR. Co.	.....	97,795	2,626	100,018
C. RR. of N. J	*	*	23,976	1,202,078
Penn. Canal Co	12,771	156,440	5,105	165,737
North & West Br. RR	13,160	407,196	8,350	230,254
	78,282	5,749,799	126,166	6,916,351
Lehigh Region.				
L. V. RR. Co	.....	2,025,924	49,540	2,333,044
C. RR. of N. J	*	*	21,206	1,126,889
S. H. & W. B. RR.	6,241	106,881	1,674	27,095
	6,241	2,132,805	72,420	3,487,028
Schuylkill Region.				
P. & R. RR. Co	1,737	4,829,270	58,710	3,292,164
Shamokin & Lykens Val	*	*	15,881	674,979
	1,737	4,829,270	74,591	3,967,143
Sullivan Region.				
St Line & Sul. RR. Co.	.....	42,572	1,173	31,100
Total	86,260	12,754,446	274,350	14,401,622
Increase	.....	.....	.....	.....
Decrease	.....	1,647,176	.....	.....

* Included in tonnage of the Philadelphia & Reading Railroad.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Total same time in 1879	12,562,206 tons.
" " " " 1880	12,932,194 "
" " " " 1881	12,932,194 "
" " " " 1882	13,183,738 "

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 125,725 tons, as compared with the corresponding period in 1883.

SHAMOKIN IRON WORKS,
Shamokin, Northumberland County, Pa.,
JOHN MULLEN, - - - Proprietor.
MANUFACTURER OF
Steam Engines, Mining, Rolling Mill, Furnace, Saw Mill,
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Special attention paid to Building ALLISON'S CATARACT STEAM PUMP, High Pressure, Compound and Condensing with or without the New Isochronal Valve Movement.